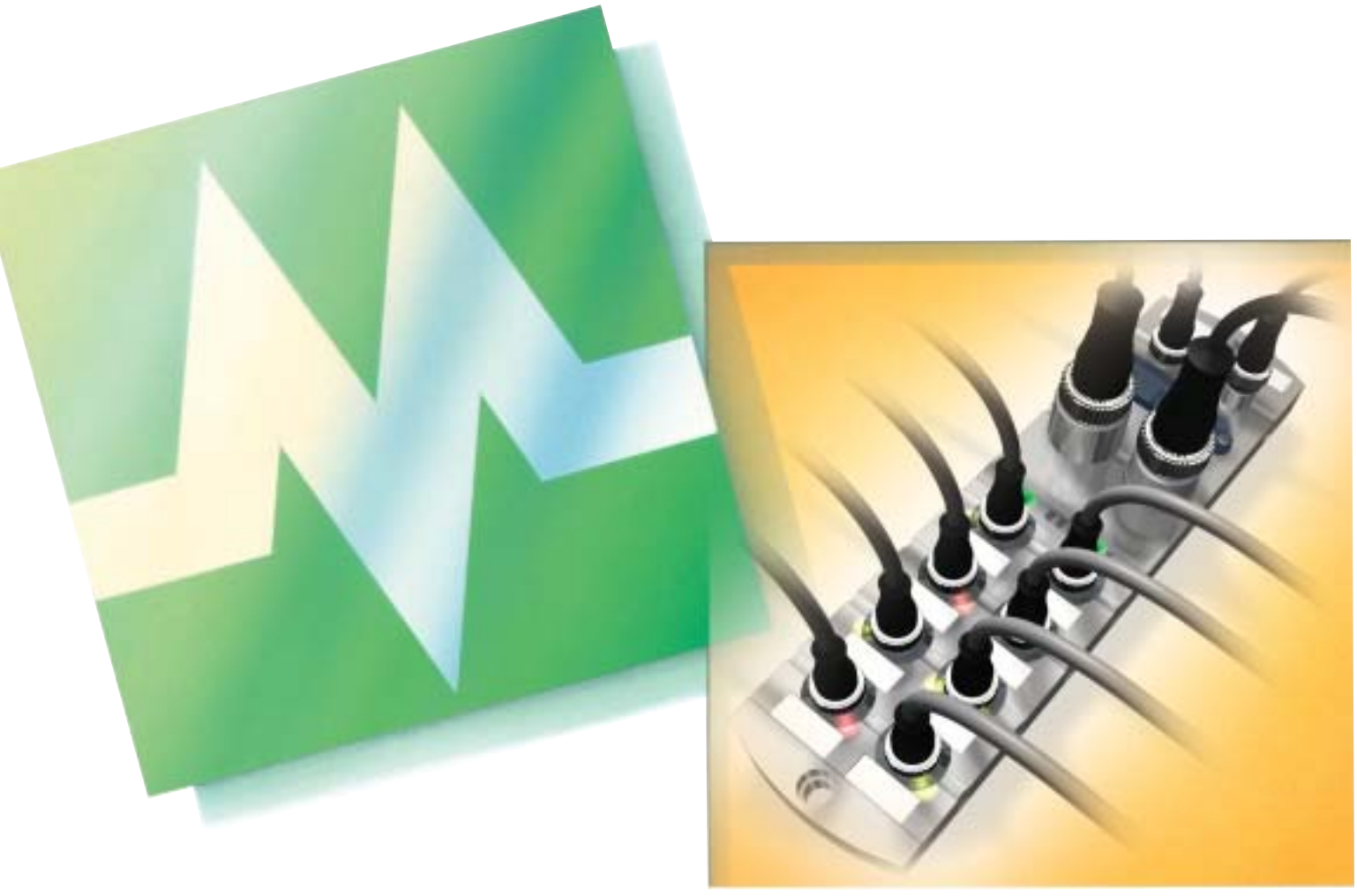
MURR ELEKTRONIK

Handbuch
Manual
Manuel

MVK-MDN

Art.-No. 55297
Art.-No. 55298
Art.-No. 55299



User's manual for modules of the

MVK-MDN series

- For use in combination with EDS files, version 1.0 -
and
- HW/SW version 1 -

Art. No. 55 297 MVK-MDN DI8 (DI8)
Art. No. 55 298 MVK-MDN DIO8 (DI8)
Art. No. 55 299 MVK-MDN DIO8 (DIO8)

User's manual Art. No. 55392 Version 1.2

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Additions / corrections to the manual

Version	Chapter	Additions/ Corrections	Date/Name
V 1.0		Issued by	16.05.2003 J.H.
V 1.1		Safety Standards	26.07.2005 M.H. / J.H.
V 1.2			10.11.2005 M.H. / J.H.

Notes :

1 Concerning this manual

Please be sure to read this Users' Manual **prior** to starting up the MVK-MDN. The manual must be stored in a conspicuous location so as to be accessible to all users at all times.

The text, illustrations, diagrams and examples presented in this manual serve solely for the purpose of explanation, operation and use of input/output modules of the MVK-MDN series.

If you should have any further reaching questions regarding the installation and set-up of the equipment described in this manual, please don't hesitate to contact us. We would be glad to assist you any time.

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Murrelektronik reserves the right to make technical changes or modifications to this manual without prior notice.

1.1 Chapter overview

The „Safety information" section must be read without fail **prior** to working with the products and the system. This section contains information required for safe installation and handling.

The „Configuration information" section describes the MVK-DN, oriented on system and component specifications. This chapter addresses itself to the system planner and offers information on important details relevant to successful configuration.

The „Installation information" section provides details regarding installation, in both mechanical and electrical contexts. This chapter addresses itself in particular to qualified and trained electricians responsible for the assembly and installation of system components.

The „Setup" section is intended for the set-up personnel. This section offers important information with regard to the rapid and uncomplicated set-up of individual modules as well as the complete system in a DeviceNet system.

1.2 Explanation of symbols

1.2.1 Use of attention signs

Notes containing important information are specially marked. These are illustrated as follows:

Attention text.....

1.2.2 Use of danger signs

Danger signs are additionally marked with an enclosing frame.

CAUTION:
Disregard of safety measures may result in damage to equipment and other serious consequences.

DANGER:
Non-compliance with the relevant safety measures poses a danger to the health and life of the user.

Use of numbering in illustrations
Illustrations are numbered with white numbers on a round black field.
Example:
❶ Text 1.....
❷ Text 2.....
❸ Text 3.....

The explanatory text follows in tabular form under the same number, in direct context to the preceeding illustration.

1.2.3 Use of handling instructions

Handling instructions describe the sequence of steps during installation, setup, operation and maintenance that must be strictly observed.

The numbering (black numbers in a white field) is given in a sequential and ascending order.
Example:
① Instruction 1.....
② Instruction 2.....
③ Instruction 3.....

1.2.4 Use of foot notes

Supplementary information is marked with superscripted numberals (example: Text Text [1)] Text Text). These are explained in the form of footnotes beneath tables or text at the end of the page.

2 Safety information

2.1 Designated use

The devices described in this manual are decentralized input/output modules intended for connection to a DeviceNet network.

The products described in this manual

- have been developed, manufactured, tested and documented in compliance with currently valid safety codes. The equipment poses no danger to operating personnel or material if configuration, assembly, and operation are performed in compliance with the stated handling and safety regulations.

- fulfill the requirements of:

    - EMC directive (89/336/EWG)
    - Machine directive (98/37/EWG) - safety component

Troublefree and safe function of this equipment is guaranteed only if the conditions for proper transport, storage, installation and assembly are observed.

The designated operation of the equipment is guaranteed only with the housing fully installed.

All devices connected to this equipment must be in accordance with SELV and PELV. Power supplies which comply to EN 61558-2-6 (transformers) or EN 60950-1 (switched-mode power supply) fulfil these requirements.

Only qualified and suitably trained electrical tradesmen knowledgeable in the safety standards of automation technology may perform configuration, installation, setup, maintenance and testing of the equipment.

Current safety and accident prevention laws valid for a specific application must be observed in the configuration, installation, setup, maintenance and testing of the equipment.

Only cables and accessories are allowed which meet the requirements and regulations for safety, electromagnetic compatibility and, where applicable, telecommunication transmission equipment and specifications.
Information concerning the type of authorized cables and accessories can be obtained either from your Murrelektronik distributor or are described in this manual.

CAUTION :
Good chemical and oil resistance. When using aggressive mediums, material resistance based on application must be checked.

2.2 Qualified personnel

Requirements to be met by qualified personnel are based on qualifications profiles described in ZVEI and VDMA guidelines.

Weiterbildung in der Automatisierungstechnik (Further training in automation technology)
Herausgeber: ZVEI und VDMA (Publisher: ZVEI and VDMA)
Maschinenbau Verlag
Posfach 71 08 64
60498 Frankfurt

Only trained electricians familiar with the contents of this manual may be allowed to install and service the components described here.

These are understood as being persons who,

- based on their trade qualification, experience and knowledge of relevant standards, are able to assess the project requirements and to recognize possible hazards.
- based on extensive experience in comparable areas, possess the same level of knowledge as could be expected of a trained tradesman.

Only Murrelektronik technical personnel are allowed to undertake intervention in the hardware and software of our equipment, unless the procedure is described in this manual.

CAUTION :
Unqualified intervention in the hardware and software of our equipment or the disregard of warnings and information provided in this manual can result in injury or serious damage to man and/or material.

3 Configuration information

3.1 DeviceNet system description

The DeviceNet is a sensor/actuator bus system which originated in the USA but is now extensively used in Asia and Europe as well. More than 350 manufacturers, including a number of leading automation technology suppliers, offer a wide spectrum of products, from sensors/actuators all the way to intelligent controllers for connection to this modern device network.
The DeviceNet network is an open low-end network that allows simple industrial devices such as sensors/actuators but also complicated devices such as barcode readers and frequency converters to be connected directly to a control system (PLC).
The DeviceNet is based on internationally standardized (EN50325 and IEC62026) and worldwide CAN (Controller Area Network) technologies (OSI layers 1 and 2). It utilizes standard chips used worldwide in various industrial applications e.g. in automobiles.
Thanks to its robust protocol and chips, DeviceNet is not sensitive to high temperatures and interference fields. The DeviceNet is also characterized by an extremely robust network performance (hamming distance = 6).
Due to these characteristics, the DeviceNet (CAN) is especially suitable for meeting the stringent demands placed on it by industrial automation technology.
In addition to this, plug-and-play connection technique coupled with power supply via the network cable (or auxiliary power cable) reduce setup and maintenance expenditure.

The DeviceNet application layer employs the modern producer-consumer method which enables highly efficient data transmission. Unlike the traditional source-target model, here this is accomplished by means of multicast and broadcast transmission, poll, strobe as well as time and event controlled (change-of-state) transmission.
Explanation (example) of DeviceNet communication types for input and output data:- Polling: The master module („Scanner“) transmits the output data cyclically to the assigned slaves and receives input data in a response telegram.

- Change of State (COS): Telegrams are transmitted as soon as the content has changed. Only the changes to the process map are transferred and not its entire content.

- Cyclic: The modules transfer data independently when a given cycle time expires.

- Strobed: The scanner requests data with a broadcast telegram to all participating devices.

Up to 8 bytes of user data per message as well as fragmentation services for larger messages provide the best conditions for optimal data collection and diagnosis of simple to intelligent field devices.
Three transfer rates for various bus lengths are available: 125, 250 and 500 kBaud.
In spite of the comparatively high busload, DeviceNet achieves short system response times by using the bus width, above all in the Change Of State mode.

The diagnostic functions of the Murrelektronik DeviceNet devices allow rapid troubleshooting. Diagnosis messages are transferred across the bus and are gathered by the master. The network connection status, the device status of the module and of the inputs/outputs and power supply, is displayed by means of LEDs (standardized).

DeviceNet is a simple and economic wiring system based on a 4-wire cable: one pair of wires for data transmission and one pair for supplying auxiliary power to sensors and actuators over a distance of up to 500 m. System expansion > 500 m is possible with the use of repeaters.

Installation is greatly simplified through the use of cable harnesses. Wiring errors are avoided and setup is more rapidly successful. The market offers field bus cables, power supply cables, sensor cables and

accessories such as terminating resistors and T-fittings. Field assembled plugs and cables are also available.

DeviceNet specifications are available to the public from the independent „Open DeviceNet Vendor Association" (ODVA). Source codes for master and slave modules are also available from various suppliers.
All manufacturers with certified DeviceNet products on the market (see Fig.3-1) are normally members of the ODVA!
As a result of our active membership in the ODVA, Murrelektronik possesses profound DeviceNet know-how for development of components for this bus system.

You will find us and the ODVA on the Internet under:

www.murrelektronik.com, www.odva.org and www.can-cia.com

Fig. 3-1 : DeviceNet Conformance Tested Logo and DeviceNet Logo (general)

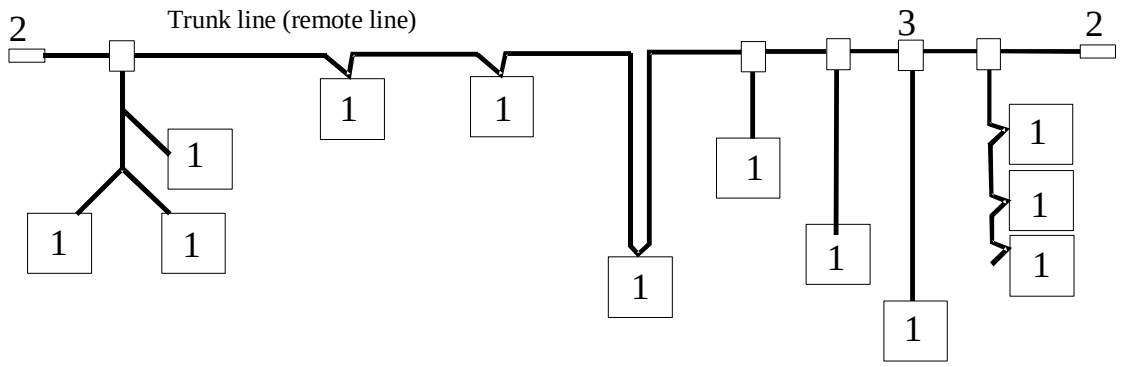


Fig. 3-2 : DN- System topology

1 - Network nodes
2 - Terminating resistor
3 - Tap

3.1.1 System data

The key system data are listed in the table below.

Table 3-1 : DN system data

Topology	Tree structure
Transfer path	Twisted, screened four-wire cable, separate leads for data (white & blue) and power (black & red)
Cable lenghts	Main cable max. 500 m, spur lines max. 6 m
Number of devices	max. 64
Number of I/O points	Dependent on the controller
Addresses	Per device one special MAC-ID in the range of 0...63
Addressing	MAC ID, series number (32 bits)
Transfer rates	Dependent on the cable length (max. 500 kBaud) 500 kBaud up to 100 m (Thick –Kabel) 250 kBaud up to 250 m (Thick –Kabel) 125 kBaud up to 500 m (Thick –Kabel) Max. length of main cable with repeaters : 3 km
User data	8 byte par telegram
Terminating resistors	121 Ω, always at the ends of the data cable
Error recognition	Identification of faulty messages, automatic repeat.
Power supply	24 V DC tolerance (total) +/- 4%

3.1.2 Information for the beginner

The DeviceNet is a field bus system for industrial application whose advantages include not only its ease of handling in planning and application but also the good overview of the total system.

To make the system even easier and safer for beginners to use, we recommend proceeding as outlined in the checklist below :

Table 3-2 : DeviceNet system information for the beginner

Work phase	Questions	Note
Planning	How many I/O's are required in total ?	This determines whether one or more DeviceNet networks will be needed for realization.
Planning	How great is the DeviceNet system power requirement ?	Important for the selection of a suitable system power supply unit. DeviceNet system network devices may be switched in parallel by a diode !
Planning	How large is the entire scope of the system ?	Repeaters must be used if the sum of all cable lengths exceeds 500.
Configuration	How will the address-to-module assignment be made ?	To avoid addressing errors, create an assignment scheme and carefully label all addressed modules accordingly !
Installation	How will the modules be installed ?	Depends on the module enclosure type. Either in a switch cabinet or terminal box. Place modules of enclosure type IP 67 close to sensors and actuators for the sake of greater efficiency.
Set-up	How will the system configuration be executed ?	In configuration mode (scanning the DeviceNet networks), the device profiles of all recognized DeviceNet devices are automatically read in by the Setup tool.
Set-up	Have all DeviceNet devices been recognized by the scanner ?	When all DeviceNet devices have been recognized, the scanner should not issue any error messages (if the devices had been added to the scan list). This enables exthaustive diagnostics..
Set-up	How can a simple I/O function test be performed ?	Quick and straightforward, with special, easy to use setup tools[1]. Alternatively, with the PLC Software Tool.

[1] e.g. Allen Bradley KFD-Box (1770)

3.1.3 DeviceNet

3.1.3.1 System cables

To meet individual application requirements, system wiring on the field bus side can be realized either with round cables or also with the gray profiled ribbon cable characteristic for DeviceNet.

Two electrical aspects are decisive in the selection of a suitable transmission cable:

a) DC resistance (line cross-section)
for reasons of auxiliary power transfer.

b) Transmission characteristics
Impedance of 121 ohms (1/4, 1/2 W or more)

Murrelektronik offers a large choice of pre-dressed round cables adapted to MVK-MDN modules.

Table 3-3 : List of pre-dressed DeviceNet bus cables

Art. No.	Description
4234520	Pre-dressed bus cable, straight, 0,3 m (Pur)
4234521	Pre-dressed bus cable, straight, 0,6 m (Pur)
4234522	Pre-dressed bus cable, straight, 1,0 m (Pur)
4234523	Pre-dressed bus cable, straight, 2,0 m (Pur)
4234524	Pre-dressed bus cable, straight, 3,0 m (Pur)
4234525	Pre-dressed bus cable, straight, 5,0 m (Pur)
4234670	Pre-dressed bus cable angle type, 0,3 m (Pur)
4234671	Pre-dressed bus cable angle type, 0,6 m (Pur)
4234672	Pre-dressed bus cable angle type, 1,0 m (Pur)
4234673	Pre-dressed bus cable angle type, 2,0 m (Pur)
4234674	Pre-dressed bus cable angle type, 3,0 m (Pur)
4234675	Pre-dressed bus cable angle type, 5,0 m (Pur)

Cables are basically of the four-wire type. Cable screening is necessary due to transmission technology requirements.

Additional auxiliary power is required for actuators.

Fig. 3-3 (DN round cable) and Fig. 3-4 (DN profile cable) show the cable layouts.

CAUTION:
The max. permissible current through the system cable (DeviceNet specification of ODVA version 2.0 Chaper 10) is 8 A !
As a result, all other devices and components (e.g. 7/8“ connector) are also designed for max. 8 A !

Cables

Gray or lilac	**- DeviceNet bus cable**
Yellow	**- 24V DC auxiliary power**

Bus cable leads

White	**- Field bus system cable (Can_H)**
Blue	**- Field bus system cable (Can_L)**
Red	**- 24V DC auxiliary power (+24V DC)**
Black	**- 24V DC auxiliary power (0V)**

Auxiliary power leads

Black lead 1	**0 V**
Black lead 2	**0 V**
Green/yellow	**PE**
Black lead 3	**Sensor & Bus power supply**
Black lead 4	**Actuator power supply**

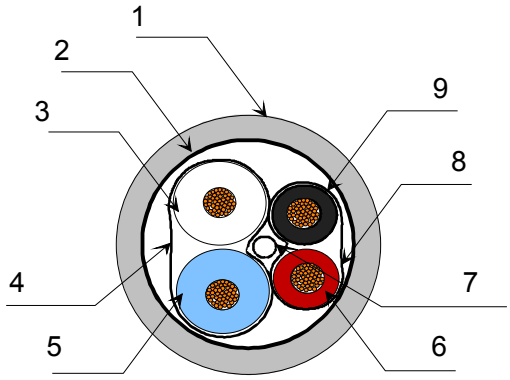


Fig. 3-3 : DN round cable

1 - Insulation
2 - Screen
3 - Bus core, white
4 - Bus core pair screen
5 Bus core, blue
6 - Power core, red
7 - Screen cable
8 - Power core pair screen
9 - Power core, black

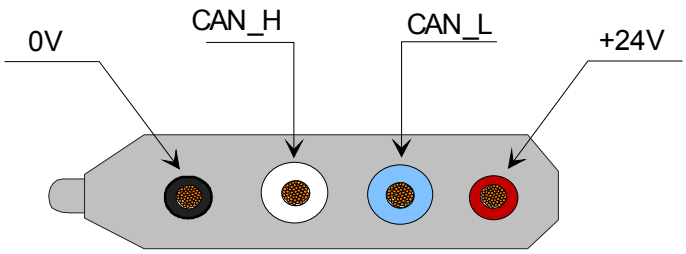


Fig. 3-4 : DN profile cable

DeviceNet products with direct connection for ribbon cable carry a geometric code. This offers reliable protection against electrical polarity reversal.

For the various cable types used (Thin, Thick and Flat), there exists a correlation between the transfer rate employed and the length of the main cable (see table below).

Table 3-4 : Correlation between the transfer rate and the length of the main cable

Data rate	Length of the main cable (Thick – Cable)	Length of the main cable (Thin – Cable)	Length of the main cable (Flat – Cable)	Total length of spur lines
500 Kbit/s	100 meters	100 meters	75 meters	39 meters
250 Kbit/s	250 meters	100 meters	200 meters	78 meters
125 Kbit/s	500 meters	100 meters	420 meters	156 meters

Attention must be paid to assure that the DeviceNet Bus between CAN_H and CAN_L is correctly terminated (121 Ω).

Table 3-5 : Art-.No.of the terminator plug MVK-MDN

Art.No.	Description
55 319	Terminating resistor plug

Calculating cable lengths :

If the distance from a branch in the main cable to its furthest removed module is greater than the distance to the next terminator, this spur line length (Drop A-C) is calculated into the total cable length.
Example :

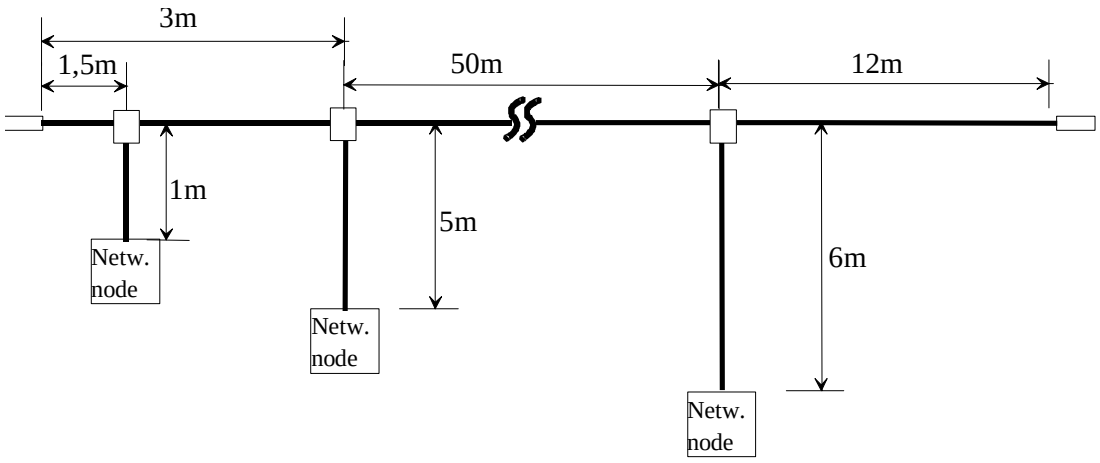


Fig. 3-5 : Example for the cable length calculation

Drop A:	does not appear in the max. cable length	1.5 m > 1 m
Drop B:	is calculated into the max. cable length	3 m < 5 m
Drop C:	does not appear in the max. cable length	12 m > 6 m

Maximum cable length 5 m + 50 m + 12 m = 67 m

The cumulative spur line length equals the sum of all spur lines in the cable system. This sum must not exceed the maximum cumulative length relative to the transfer rate (see Wiring Tab).

Example :

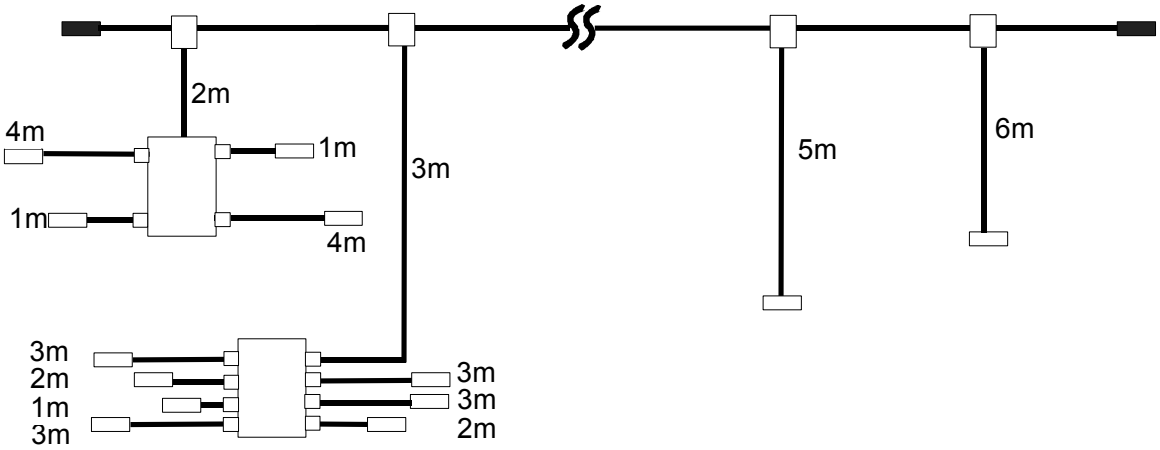


Fig. 3-6 : Example for the cable length calculation

13 modules are connected. No module is more than 6 m from the main cable – tap. The cumulative length is 45 m. This means that a max. data rate of 250 kbit/s can be used.

3.1.3.2 System plug connectors

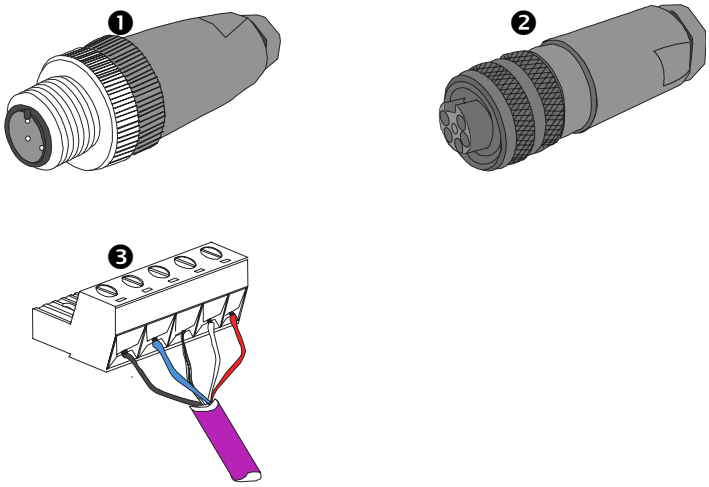


Fig. 3-7 : DN connector system & auxiliary power

Connector overview :

❶ Micro-Style plug
❷ Mini-Style plug
❸ Open-Style plug

Table 3-6 : Murrelektronik Art. No. for plug connectors

Art. No.	Description
27626	M12 Micro-Style connector (plug) straight, A-coded
27621	M12 Micro-Style connector (socket) straight, A-coded
27663	7/8" Mini-Style connector (plug) straight
27661	7/8" Mini-Style connector (socket) straight

3.1.3.2.1 Mini- style (7/8“) connector 5 pin

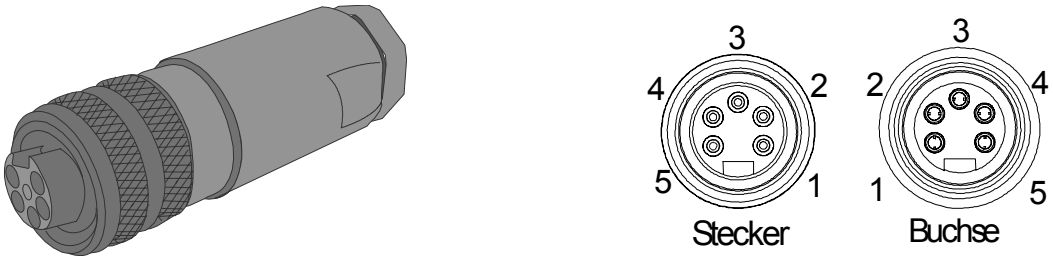


Fig. 3-8 : DN- 7/8“ Mini-style plug 5 pin

Pin1:	Screen	Screen
Pin2:	V+	Red
Pin3:	V–	Black
Pin4:	CAN_H	White
Pin5:	CAN_L	Blue

3.1.3.2.2 Open-Style connector with assignment

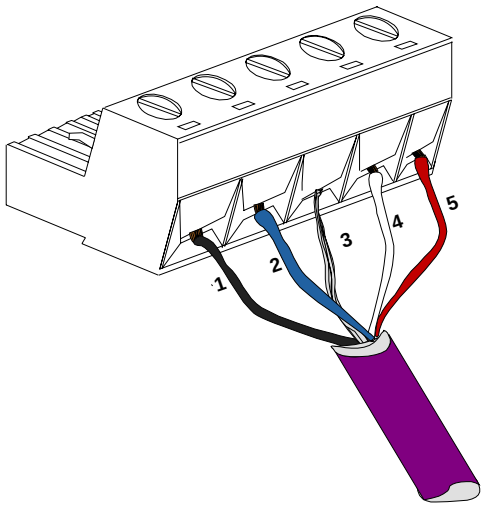
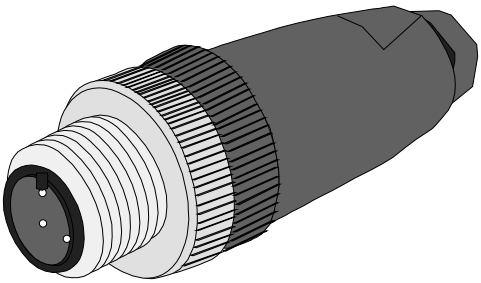


Fig. 3-9 : DN- Open-Style network connector

Pin1:	V–	Black
Pin2:	CAN_L	Blue
Pin3:	Screen	Screen
Pin4:	CAN_H	White
Pin5:	V+	Red

3.1.3.2.3 Micro Style connector with assignment



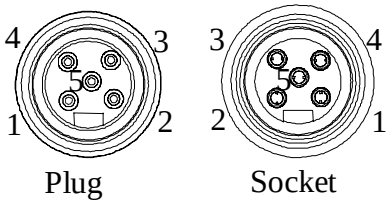


Fig. 3-10 : DN-Micro Style network connector

Pin1:	Screen	Screen
Pin2:	V+	Red
Pin3:	V–	Black
Pin4:	CAN_H	White
Pin5:	CAN_L	Blue

3.1.3.3 System power supply

DeviceNet modules typically require a 24V DC power supply (Class 2) which must conform to the DeviceNet industrial power supply standards.

We recommended the use of separate power supplies for the sensors and actuators in order to achieve a higher degree of noise immunity and insulation.
We recommend the use of primary switched-mode power supplies for use with the DeviceNet bus and for the sensors and actuators.
When using in-phase regulated power supplies, assure that in case of error (short circuit etc.) power switch-off at the power supply unit takes place as late as possible!

The rating of the power supply units depends on the number of connected modules and on their power rating

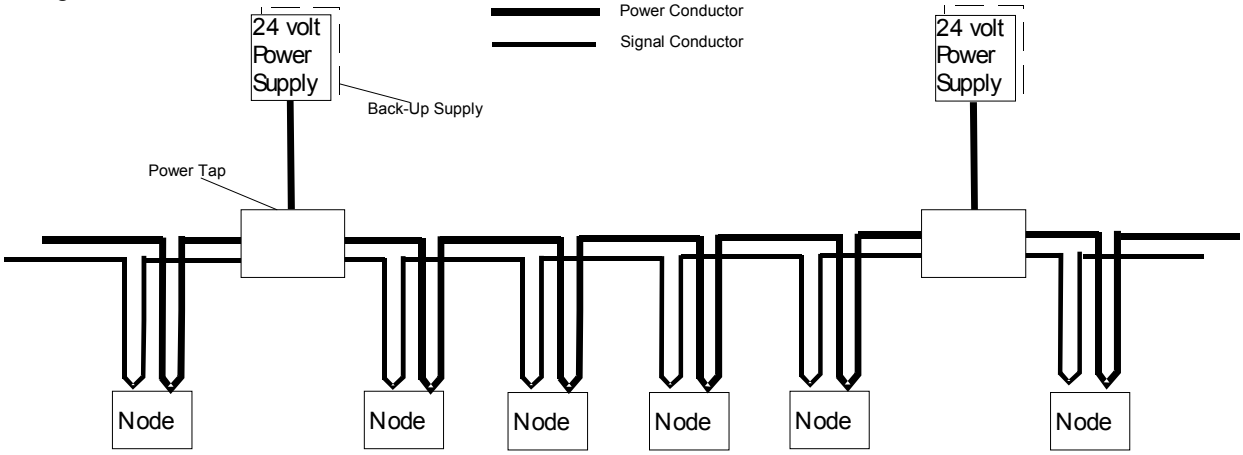


Fig. 3-11 : DeviceNet system power supplies

For energy supply (power supply unit), DeviceNet systems require direct voltage in the range of 23.76 V to 24.24 V DC (24V +/- 1%), which must conform to IEC regulations for “Functional extra-low voltages with safe isolation” (PELV).

Fig. 3-12: DeviceNet Power Top shows the diagram of a Power Tap

A power supply unit can be integrated at any point in the network.
Only power taps with Schottky diodes may be used !

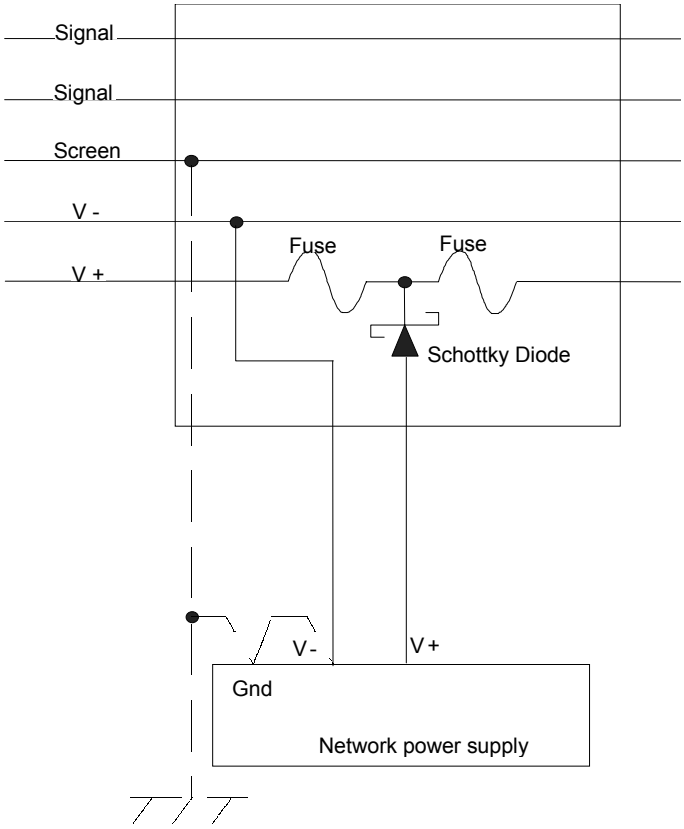


Fig. 3-12 : DeviceNet Power Tap

System-related limit values regarding system power supply must be strictly observed if maximum functional safety and troublefree operation are to be ensured.

Always ensure that the system power, measured at the device furthest away from the power supply, does not drop below 23.04 V (24 V – 4 %) DC.

A voltage drop, dependant on the load current, results on the system cable as the DeviceNet modules together with all attached sensors are supplied centrally from the DeviceNet power supply unit.

In critical cases, voltage drop optimization can be achieved by changing the location of the power supply unit within the system layout and by using power supply cables of a greater conductor cross-section (Thick- cable, Thin- cable, Flat- cable).

The MVK-MDN electronics are supplied by the DeviceNet Bus. Auxiliary power supply is required for the power supply of sensors or actuators. At least two power supply voltages (bus voltage and sensor voltage) are required for a regular operation of the system. The power supply of sensors is provided by the 7/8“ connector (socket). The module can communicate with the bus as soon as it is supplied by the power supply of the DeviceNet Bus.

3.1.3.4 Core cross-sections

The chief determining factor in selecting a suitable transmission cable in regard to energy transfer is the DC resistance.

The following diagrams are excerpts from the ODVA specification (Chapter 10-2.1).

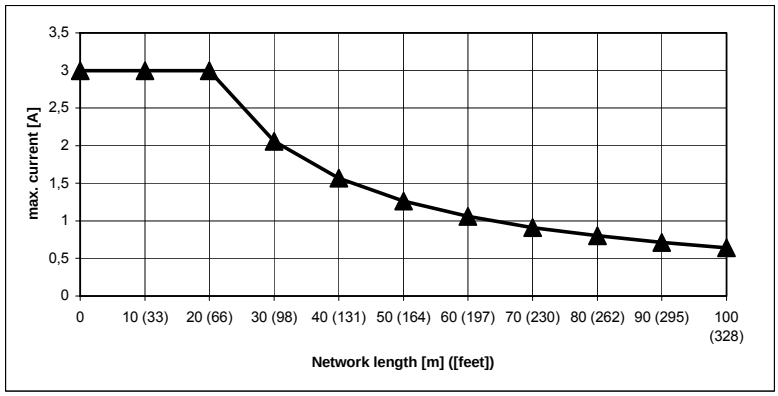


Fig. 3-13 : Thin-cable load in dependance of cable length

Table 3-7 : Influence of various cable lengths

Network length [m] ([feet])	0	10 (33)	20 (66)	30 (98)	40 (131)	50 (164)	60 (197)	70 (230)	80 (262)	90 (295)	100 (328)
max. current [A]	3,00	3,00	3,00	2,06	1,57	1,26	1,06	0,91	0,80	0,71	0,64

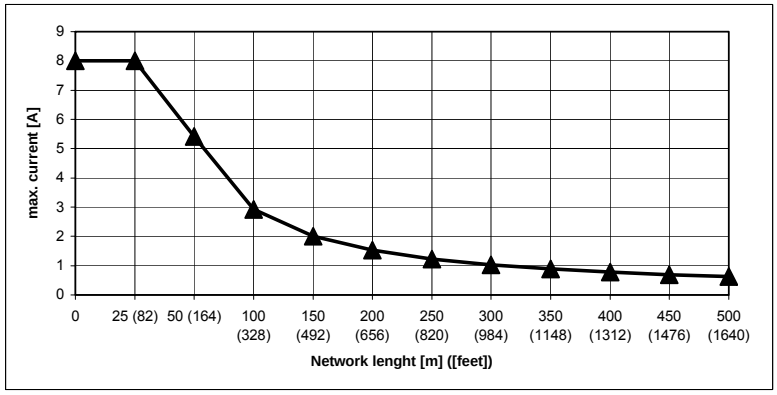


Fig. 3-14 : Thick-cable load in dependance of cable length

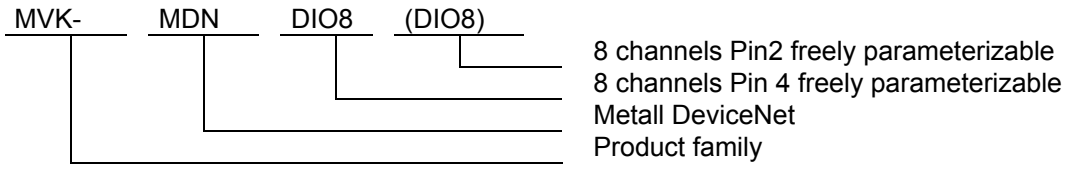
Table 3-8 : Influence of various cable lengths

Network length [m] ([feet])	0	25 (82)	50 (164)	100 (328)	150 (492)	200 (656)	250 (820)	300 (984)	350 (1148)	400 (1312)	450 (1476)	500 (1640)
max. current [A]	8,00	8,00	5,42	2,93	2,01	1,53	1,23	1,03	0,89	0,78	0,69	0,63

3.2 Composition of product designation

The designation of a component of the MVK-MDN system gives an indication of its function.

Example :



3.3 Electromagnetic Compatibility (EMC)

CE

This equipment fulfills the requirements of EC directive 89/336/EWG „Electromagnetic Compatibility“

CAUTION :
This equipment has a Class A and B rating. The system constructor alone shall be responsible for ensuring that the complete system complies with the applicable EMC requirements.

Each of the devices described in this manual meets the EMC requirements laid down in the relevant standards. However, this does not guarantee their electromagnetic compatibility when used in a system.

The user is therefore strongly recommended to observe the following information on EMC-oriented installation. Only if these conditions are met and individually CE-labeled components are used may it be assumed that the complete system meets the applicable EMC requirements.

The system constructor alone shall be responsible for ensuring that the complete system complies with the applicable EMC requirements.

3.3.1 Protection against electrostatic discharge

The products described in this manual contain complex semiconductor elements which can be destroyed or damaged by electrostatic discharges (ESD). Damage does not necessarily result in an immediately recognizable failure or malfunction. Failure or malfunctioning can occur with delayed effect or sporadically.

ATTENTION :
Connectors must not be connected or disconnected live.

The generally known safety precautions for ESD sensitive devices must be observed when handling the devices. The following precautions in particular must be taken :

ATTENTION :
The person handling the device must discharge himself electrostatically before touching the devices directly. This can be done by touching a grounded part of the system or by carrying an ESD static-dissipative grounding tape connected to ground.

3.3.2 Grounding

A low-impedance connection of the shortest possible length between the earth terminal and reference earth is required in order to dissipate interference voltages between the device and reference earth. The inductance of standard PE lines represents a high impedance for high frequency interference voltages. For this reason, the use of grounding straps is advised. If this is not possible, a finely stranded PE line with as large a cross-section as possible should be chosen, and the connection to ground should be as short as possible.

3.3.3 Cable routing

A frequently cause of EMC problems is failure to observe the elementary rules of cable routing!

- ✓ The DeviceNet data line must be laid as far away from power lines as possible.
- ✓ A minimum distance of 10 cm must be maintained.
- ✓ Data lines and power lines should only cross over at right angles.
- ✓ It is recommended that data lines and power lines be laid in separate and shielded chambers.
- ✓ The interference potential of other devices or lines must be taken into account when laying cables. The greatest possible distance must be maintained to frequency inverters, motor lines and other devices or lines which emit high frequency interference.

3.3.4 Voltage dips

The supply to the electronics is buffered via integrated capacitances in such a way that short voltage interruptions generally do not impair operation. This does not apply to the supply of sensors and actuators connected to MVK-MDN whose high power demand cannot be protected by building capacitances into the device. Even short interruptions in the actuator voltage can, therefore, lead to unwanted switching operations.
Thanks to the integral input filters, an interruption of < 1 ms in the sensor supply does not alter the input state signaled to the DP master. Longer interruptions in the sensor supply can lead to a change of input signal.

3.3.5 Separate voltage supply

The sensors or actuators can be supplied via a common power supply unit. However, a separate supply is recommended, in order to maximize the electromagnetic compatibility of the complete system.

3.3.6 Interference suppression of inductive loads

The outputs of the devices described in this manual have an integrated protective circuit that provides safety against the high-energy interference voltages which can occur when switching inductive consumers.

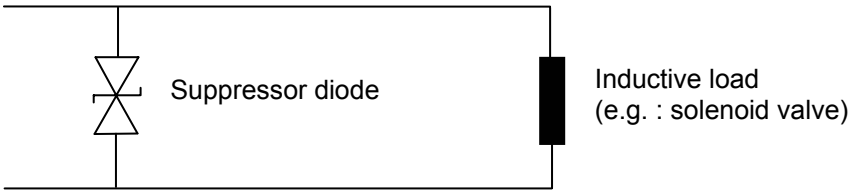


Fig. 3-15 : Interference suppression of infuctive loads

The suppressor diode ensures rapid dissipation of the energy stored in the magnetic field of the inductive load.

The high voltages which occur when switching off inductive loads produce strong fields in the wiring. These fields can in turn trigger faults in adjacent circuits or devices. For this reason, it is recommended that an additional inductive load circuit be provided where large distances exist between the module output and the load or where high inductive loads occur for other reasons. As a result, the voltage peak produced by the inductive load will be short-circuited directly at the source.

Murrelektronik GmbH can supply you with a wide selection of interference suppression products for this purpose.

3.3.7 Don't let limitations limit you

With some system configurations, the requirements for noise emission or EMC can only be fulfilled at additional cost, or even cannot be fulfilled at all, since EMC within the system is also dependent on the component parts supplied by other manufacturers.

- ✓ Mains filters are a suitable means of reducing line-conducted interference.
- ✓ Various manufacturers supply optical fiber converters. Data transferred by means of optical fibers is basically immune to interference. However, this does not apply to the electronics required for the purposes of conversion. Therefore, not even the use of optical fiber can solve every EMC problem.

If you have any further queries regarding EMC or seek advice on how to ensure that your systems fulfill the EMC Directive, please contact our accredited test center.

MURRELEKTRONIK Test Center
Grabenstr. 27
D-71 570 Oppenweiler
Tel.:07191 / 47 – 320
Fax: 07191 / 47 – 323
Pruefzentrum@murrelektronik.de

4 Installation information

4.1 Connection overview

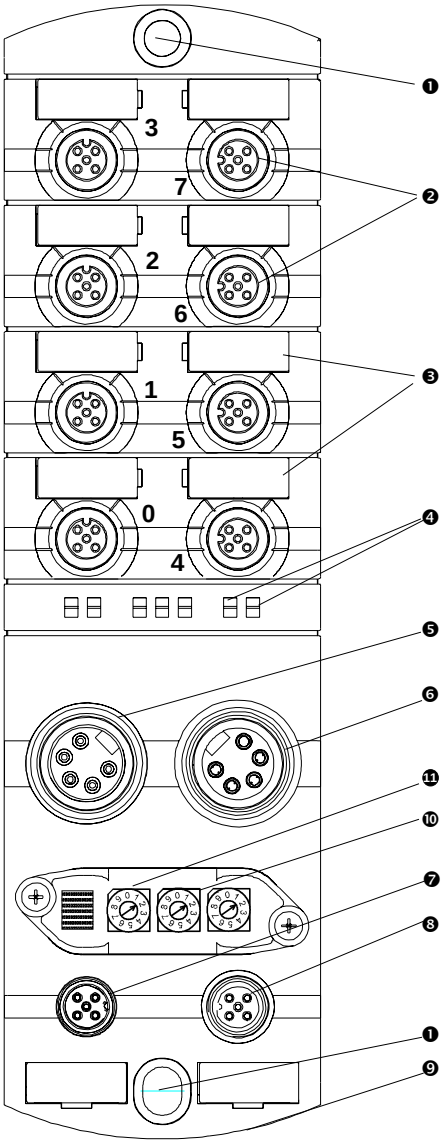


Fig. 4-1 : MVK-MDN module connection overview

❶ Mounting holes
❷ M12 round sockets for inputs and outputs
❸ Indentification label
❹ Display elements
❺ Power supply connection
❻ Outgoing power supply connection
❼ Incomming bus interface
❽ Outgoing bus interface
❾ PE connection
❿ Adress switch
⓫ Baud rate switch

4.2 Dimensions and mounting

The modules of the MVK-DN series can be mounted directly on an installation panel or on a machine. The module features two mounting holes for this purpose.

It must be assured that the mounting surface is smooth and flat to prevent mechanical stress in the module housing. The module is affixed with two screws 6 mm in diameter and two lock washers DIN 433 T_1/T_2. The required torque is 9 Nm.

ATTENTION:
The minimum distance between two adjacent modules should exceed 3 mm.

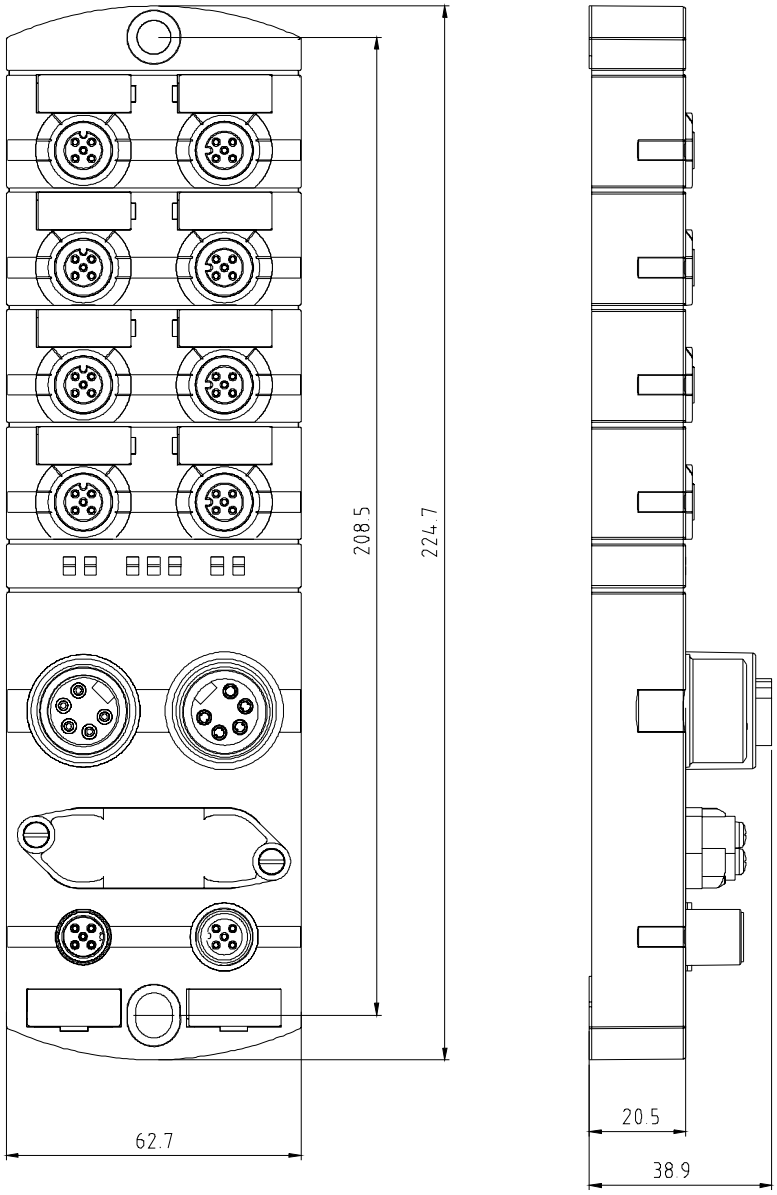
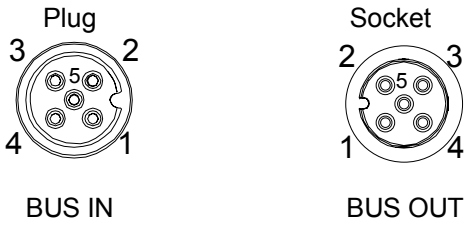


Fig. 4-2 : Attachment dimensions

4.2.1 Contact assignments of bus connection M12 (A-encoded)

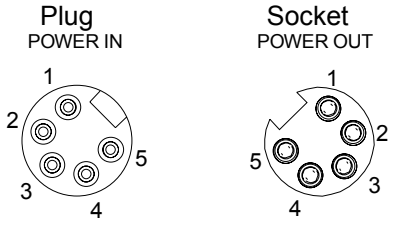


Contact No.	Signal	Description
1	Screen	Bus screen
2	V+	24 V DC Bus node power supply
3	V-	0 V DC Bus node power supply
4	CAN_H	CAN_HIGH
5	CAN_L	CAN_LOW
Thread	. / .	no potential

Fig. 4-3 : Bus contact assignments

High impedance connection between the screen in the bus node and PE according to ODVA requirements. The bus node cap has PE-potential and no direct connection to the screen.

4.2.2 Contact assignments of power connector 7/8" (Mini-Style)



Pin 1	0 V
Pin 2	0 V
Pin 3	PE
Pin 4	Sensor supply
Pin 5	Actuator supply

Fig. 4-4 : Contact assignments of power connector 7/8" (Mini-Style)

4.2.3 Grounding cable

The PE connection is located at the top housing-edge of the module. A PE grounding strap is already installed.

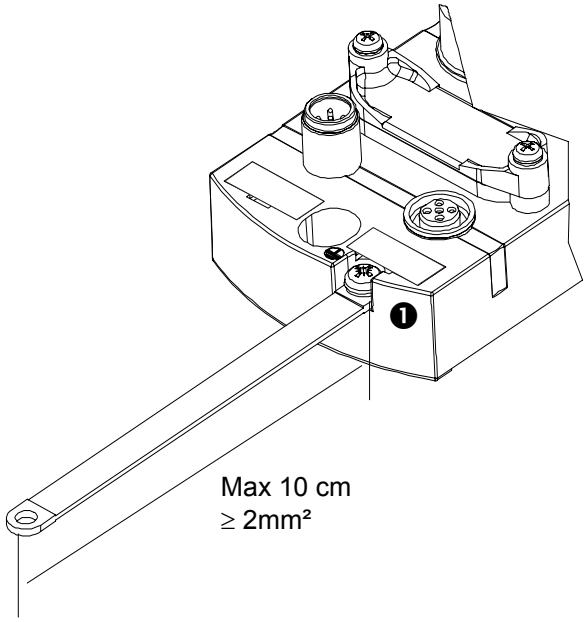


Fig. 4-5 : PE connection

❶ PE connection (PE grounding strap is already connected)

Connect the grounding cable at the PE connection on the housing in a low impedance manner.

4.2.4 Supply voltage terminal

4.2.4.1 5-pin Mini – Style connector (7/8")

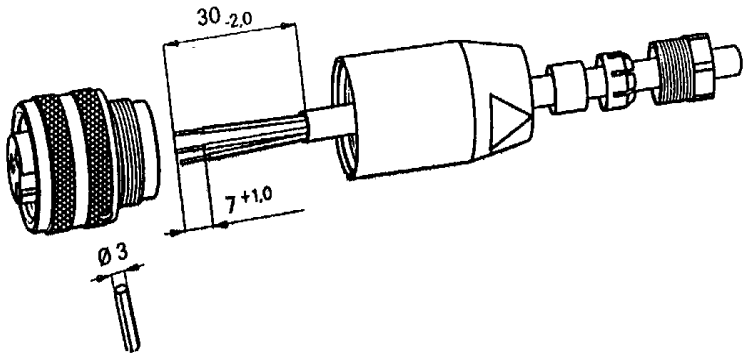


Fig. 4-6 : Assembly of the power supply line

The max. permissible cross-section of the line is 1,5 mm². It is limited by the 7/8“ connector.

The chief determining factor in selecting a suitable transmission cable in regard to energy transfer is the DC resistance.

4.2.4.2 Connecting the power supply

Auxiliary power supply is needed to supply the actuators and sensors.

CAUTION :
Wrong poling of the power supply can damage the module.

Always ensure that the sensor’s and actuator’s power supply voltage, measured at the module furthest away from the power supply does not drop below 18 V DC.

CAUTION :
Please note that the 7/8“ connector is designed for max. 8 A per pin. This must be taken into account for downstream power supply.

4.2.5 Bus connection

4.2.5.1 Terminating resistor

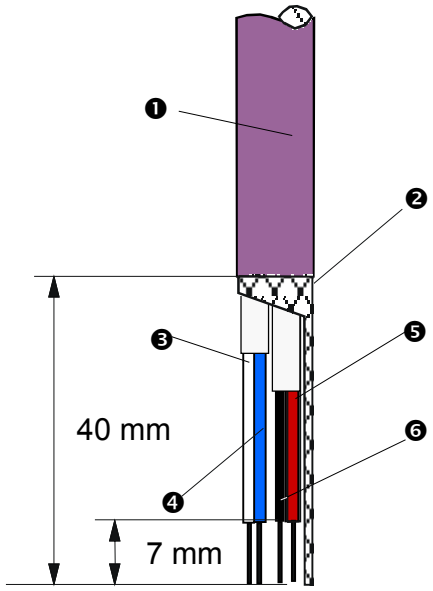
The DeviceNet must be correctly terminated with a terminating resistor at both ends.

Art. No.	Description
55 319	Terminating resistor plug

4.2.5.2 Dressing the bus cables

The DeviceNet bus cables can be dressed freely. We offer the following accessories for this purpose

Art. No.	Description	Comment
27626	M12 plug straight, A-coded	
27621	M12 socket straight, A-coded	



❶ Bus cable
❷ Screen
❸ CAN_H (white
❹ CAN_L (blue)
❺ Wire V+ (red)
❻ Wire V- (black)

Fig. 4-7 : Dressing the DeviceNet bus cable

4.2.6 Sensor and actuator connection

Fig. 4-8 : M12 socket assignment

Pin 1	+ 24 V	Sensor supply
Pin 2	Function channel 1x	Parameterizable channel
Pin 3	0 V	Reference potential
Pin 4	Function channel 0x	Parameterizable channel
Pin 5	PE	Ground

4.2.7 Unused connections

Nicht verwendete Buchsen sind mit Blindkappen zu versehen. Ansonsten ist die Schutzart IP 67 nicht gewährleistet.

Art. No.	Designation
55 468	M12 blind cap black (4 pieces)
55 390	7/8“ blind plug (external thread)

4.2.7.1 Sensor power supply

Sensors can be supplied via pin 1 (+24V) and pin 3 (0V) of the M12 sockets. A re-settable PTC per M12 socket protects the sensor supply. The max. current draw for sensor power supply is 200 mA for each M12 socket. Please note the following derating diagram.

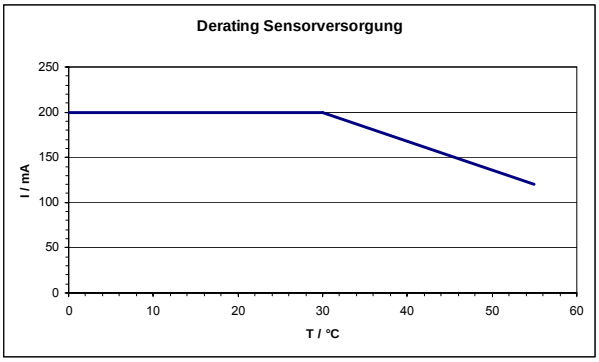


Fig. 4-9 : Derating diagram

CAUTION :
Please note that the 7/8“ connector (5-pin) is designed for max. 8 A per pin. This must be taken into account for downstream power supply.

CAUTION :
If the sensor power supply drops below 12 V, the input and channel-related diagnosis status are no more displayed.

4.2.7.2 Actuators

Each output can be loaded to a maximum of 1.6 A. The sum current may not exceed 8 A due to the maximum current carrying capacity (ampacity) of the power connector.

CAUTION :
Please note that the sum current of all modules may not exceed 8A when the actuator power supply is routed forward via the 7/8" connection (5-pin).

CAUTION :
The sum current of all actuator must not exceed 8 A.

CAUTION :
Reverse polarity of the actuator power can damage the module (only for Art.-No. 55298 and 55299) !

If an overload or short-circuit occurs at an output, that output will be disabled. This output will remain disabled even when the error has been corrected. In order to reset the short-circuit memory, the output must be reset at the control or switched off by the actuator supply voltage.

5 Startup

The field bus including the scanner must be started for setup. The network is then scanned by the software tool (incl. hardware). Prior to this, the EDS files of the MVK-MDN modules must be incorporated into the software.
The DeviceNet devices are recognized in the sequence in which they were addressed in the bus. If any devices in the bus were addressed by software, these devices may only be taken on the bus sequentially as they all have the same pre-set MAC-ID!
When the entire system has been configured and the bus communication is active, additional modules may join the bus at any time if the MAC-ID and the Baud rate are correctly set.
Typical errors during setup include: damage to the bus cable, incorrect Baud rate, Mac-ID duplicity, CAN_H and CAN_L swapped on the bus cable, power supply (auxiliary power) not available, bus not correctly terminated and EDS files incorrectly or not at all integrated !

Prior to setup, a competent system structure check of the field bus must be assured.

Devices possessing identical MAC-ID's will not complete the MAC-ID test. After the self test, the NS-LED lights up red.

Each module type possesses an EDS file (*.eds) + Icon (*.ico)

5.1 Setting and assigning DeviceNet addresses

The DeviceNet address is set directly at the MVK-MDN via two BCD switches. Values between 0 and 63 are allowable. Address 0 is normally allocated to a DeviceNet master. For MVK-MDN, therefore, we recommend that you set addresses from address 1 onwards. When setting an address greater than 63, the device uses the default address 63.

It is important to ensure that an explicit and unique address is assigned to each DeviceNet user.

The set address is read in once after the supply voltage is applied.

The node address switch is identified by the mark "NA".

See fig. 5-1 (baudrates (DR) and address switch) for position and arrangement of the switches and 4-1: connection overview of the MVK-MDN module

5.2 DeviceNet baud rate setting

The DeviceNet address is set directly at the MVK-MDN via a BCD switch. Values between 0 and 2 are allowable. When setting a baud rate greater than 2, the device uses the default baud rate which corresponds to the switch position 0.
Switch positions :

0 = 125 kBit / s.
1 = 250 kBit / s.
2 = 500 kBit / s.
all other positions = 125 kBit / s

Make sure that the baud rate setting is identical for all devices in the DeviceNet network.

The set baud rate is read in once after the supply voltage is applied.

The data rate switch is identified by the mark "DR".

See fig. 5-1 (baudrates (DR) and address switch) for position and arrangement of the switches and 4-1: connection overview of the MVK-MDN module

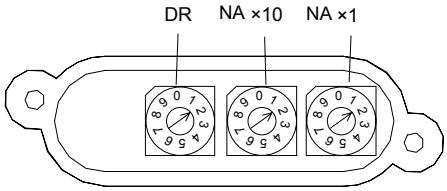


Fig. 5-1 : Data rate (DR) and address (NA) switches

5.3 EDS files

An EDS file[2] is required for the setup of a DeviceNet module.

The EDS file is created explicitly for the device type. Consequently, each module of the MVK-MDN series has an EDS file (*.eds) plus an icon (*.ico).

The EDS file contains a lot of information concerning the module e.g.:
Manufacturer, Article No. Vendor Id., device classification, software versions, hardware versions, possible operating modes, default mapping, parametering option etc.

The most current EDS files can be found on the Internet under www.murrelektronik.com :

Table 5-1 : Example for a standard EDS file

English version	Short description
MVKMDNDI8DI8E.eds	EDS-file for Art.-No. 55297
MVKMDNDIO8DI8E.eds	EDS-file for Art.-No. 55298
	EDS-files for Art.-No. 55299
0IN 2OUT Left-Right MVK-MDN 55299.eds	
10IN 7OUT default MVK-MDN 55299.eds	
10IN 7OUT MVK-MDN 55299.eds	
2IN 2OUT Left-Right MVK-MDN 55299.eds	
2IN 2OUT MVK-MDN 55299.eds	
3IN 0OUT Left-Right MVK-MDN 55299.eds	
4IN 0OUT Left-Right MVK-MDN 55299.eds	
5IN 1OUT Left-Right MVK-MDN 55299.eds	

If you need some help from our Support teams to adapt standard EDS files, please contact your distributor or our head office.

email : info@murrelektronik.de

EDS files are module-specific! Only trained Murrelektronik personnel are allowed to undertake application-specific modifications !

There are several EDS-versions as an option for Art.-No. 55299. Which file to choose depends on the selected data format and the data length.

[2] electronic data sheet

5.4 Operating modes

The following transmission services are available for I/O data tranfers :

- **Poll,**
- **Change of State (COS),**
- **Cyclic.**

The I/O data are polled by means of the Default-Parameters set in our EDS files.

5.4.1 Polling

Poll Command : the I/O message is directed to a single specific slave module (Point-to-Point). The master must send a separate „Poll“ command to each "Poll" slave containing the output data of that slave (that is, the device has outputs)

Poll Response : the „polled“ slave transmits back its input data (that is, if it supplies input data). The typical pollling time of a PLC is about 10 ms.

5.4.2 Change of State

Status change : the devices tranfer their I/O data when the latter's status changes.

Heartbeat : used as device monitoring in this operating mode ; a cyclical check (e.g. every 250 ms) is made to see if the slave is still on the network.

The bus load can be reduced with this efficient operating mode (for discrete I/O applications) !

5.4.3 Cyclic

Cyclic data transfer : the devices transfer their I/O data according to a user configurable time base.

This operation mode is suitable for very efficient analog I/O applications !

5.5 I/O data map

Following the scan phase, the scanner will have identified all devices and have received information on data width, operating mode etc. The scanner creates an adequate periphery map of all recognized slaves in the DeviceNet system from this information.

The I/O data of the MVK MDN modules are registered in class 4, attribut 3 of a manufacturer specific instance and can be fetched by means of an Explizit Message service. The data format is identical for the 3 supported operating modes.

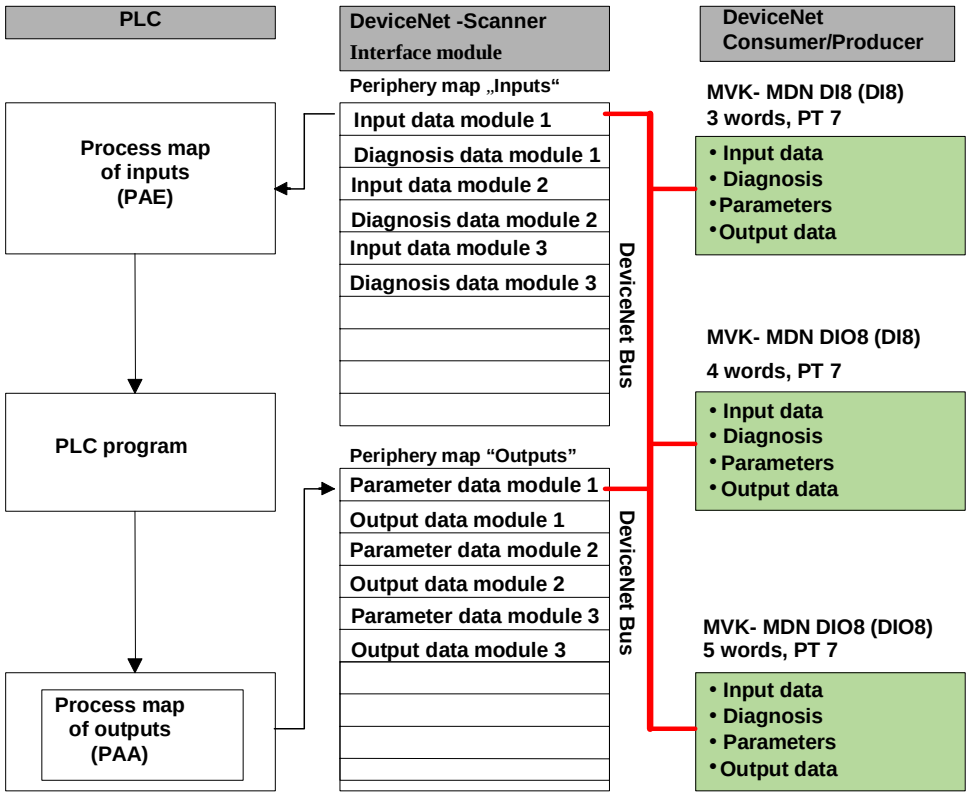


Fig. 5-2 : Data transfer between the PLC, interface module (scanner) and DeviceNet devices

The DeviceNet bus master creates a periphery map of all recognized DeviceNet bus devices and maps them according to their physical location in a scan list.
The user has the possibility of assigning logical addresses (in the PLC) to the scan list in accordance with the bus devices periphery map.

5.5.1 Input data + Diagnosis data, Art.-No. 55297

Manufacturer specific format with 16 bit inputs, status bit for each input (status of the sensor power supply), global diagnosis for the module and channel-related Desina diagnosis.

Table 5-2 : Input data table for Art.-No. 55297

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 7	Input Channel 6	Input Channel 5	Input Channel 4	Input Channel 3	Input Channel 2	Input Channel 1	Input Channel 0
1	Input Channel 17	Input Channel 16	Input Channel 15	Input Channel 14	Input Channel 13	Input Channel 12	Input Channel 11	Input Channel 10
2	Status Channel 7	Status Channel 6	Status Channel 5	Status Channel 4	Status Channel 3	Status Channel 2	Status Channel 1	Status Channel 0
3	Status Channel 17	Status Channel 16	Status Channel 15	Status Channel 14	Status Channel 13	Status Channel 12	Status Channel 11	Status Channel 10
4	Global diagnosis status							
5	Desina Channel 17	Desina Channel 16	Desina Channel 15	Desina Channel 14	Desina Channel 13	Desina Channel 12	Desina Channel 11	Desina Channel 10

5.5.2 Input data + Diagnosis data, Art.-No. 55298

Manufacturer specific format with 16 bit inputs, status bit for each input (status of the sensor power supply), global diagnosis for the module and channel-related Desina diagnosis.

Table 5-3 : Input data table for Art.-No. 55298

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 7	Input Channel 6	Input Channel 5	Input Channel 4	Input Channel 3	Input Channel 2	Input Channel 1	Input Channel 0
1	Input Channel 17	Input Channel 16	Input Channel 15	Input Channel 14	Input Channel 13	Input Channel 12	Input Channel 11	Input Channel 10
2	Status Channel 7	Status Channel 6	Status Channel 5	Status Channel 4	Status Channel 3	Status Channel 2	Status Channel 1	Status Channel 0
3	Status Channel 17	Status Channel 16	Status Channel 15	Status Channel 14	Status Channel 13	Status Channel 12	Status Channel 11	Status Channel 10
4	Global diagnosis status							
5	Desina Channel 17	Desina Channel 16	Desina Channel 15	Desina Channel 14	Desina Channel 13	Desina Channel 12	Desina Channel 11	Desina Channel 10
6	Actuator disabled Channel 7	Actuator disabled Channel 6	Actuator disabled Channel 5	Actuator disabled Channel 4	Actuator disabled Channel 3	Actuator disabled Channel 2	Actuator disabled Channel 1	Actuator disabled Channel 0
7	Actuator warning Channel 7	Actuator warning Channel 6	Actuator warning Channel 5	Actuator warning Channel 4	Actuator warning Channel 3	Actuator warning Channel 2	Actuator warning Channel 1	Actuator warning Channel 0

5.5.3 Input data + Diagnosis data, Art.-No. 55299 (Default)

Manufacturer specific format with 16 bit inputs, status bit for each input (status of the sensor power supply), global diagnosis for the module and channel-related Desina diagnosis.

Table 5-4 : Input data table for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 7	Input Channel 6	Input Channel 5	Input Channel 4	Input Channel 3	Input Channel 2	Input Channel 1	Input Channel 0
1	Input Channel 17	Input Channel 16	Input Channel 15	Input Channel 14	Input Channel 13	Input Channel 12	Input Channel 11	Input Channel 10
2	Status Channel 7	Status Channel 6	Status Channel 5	Status Channel 4	Status Channel 3	Status Channel 2	Status Channel 1	Status Channel 0
3	Status Channel 17	Status Channel 16	Status Channel 15	Status Channel 14	Status Channel 13	Status Channel 12	Status Channel 11	Status Channel 10
4	Global diagnosis status							
5	Desina Channel 17	Desina Channel 16	Desina Channel 15	Desina Channel 14	Desina Channel 13	Desina Channel 12	Desina Channel 11	Desina Channel 10
6	Actuator disabled Channel 7	Actuator disabled Channel 6	Actuator disabled Channel 5	Actuator disabled Channel 4	Actuator disabled Channel 3	Actuator disabled Channel 2	Actuator disabled Channel 1	Actuator disabled Channel 0
7	Actuator warning Channel 7	Actuator warning Channel 6	Actuator warning Channel 5	Actuator warning Channel 4	Actuator warning Channel 3	Actuator warning Channel 2	Actuator warning Channel 1	Actuator warning Channel 0
8	Actuator disabled Channel 17	Actuator disabled Channel 16	Actuator disabled Channel 15	Actuator disabled Channel 14	Actuator disabled Channel 13	Actuator disabled Channel 12	Actuator disabled Channel 11	Actuator disabled Channel 10
9	Actuator warning Channel 17	Actuator warning Channel 16	Actuator warning Channel 15	Actuator warning Channel 14	Actuator warning Channel 13	Actuator warning Channel 12	Actuator warning Channel 11	Actuator warning Channel 10

5.5.4 2 Bytes Input data

The assembly instance 5 is used.

Table 5-5 : Input data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel07	Input Channel06	Input Channel05	Input Channel04	Input Channel03	Input Channel02	Input Channel01	Input Channel00
1	Input Channel17	Input Channel16	Input Channel15	Input Channel14	Input Channel13	Input Channel12	Input Channel11	Input Channel10

5.5.5 2 Bytes Input data (Left/Right Format)

The assembly instance 5 is used. Assignment of the channels to the bit position has been changed (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**)

Table 5-6: Input data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 13	Input Channel 3	Input Channel 12	Input Channel 2	Input Channel 11	Input Channel 1	Input Channel 10	Input Channel 0
1	Input Channel 17	Input Channel 7	Input Channel 16	Input Channel 6	Input Channel 15	Input Channel 5	Input Channel 14	Input Channel 4

5.5.6 3 Bytes Input data + Sensor diagnosis bit Art.-No. 55299 (Left/Right format)

The assembly instance 15 is used.

Table 5-7: Input data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 13	Input Channel 03	Input Channel 12	Input Channel 02	Input Channel 11	Input Channel 01	Input Channel 10	Input Channel 00
1	Input Channel 17	Input Channel 07	Input Channel 16	Input Channel 06	Input Channel 15	Input Channel 05	Input Channel 14	Input Channel 04
2	IGS[3]	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”

If the IGS-bit is set, at least one socket has a sensor short-circuit.

[3] IGS = Input Group Status (0=working, 1=Fault)

5.5.7 4 Bytes Input data + Diagnosis data Art.-No. 55299 (Left/Right format)

Table 5-8: Input data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 13	Input Channel 03	Input Channel 12	Input Channel 02	Input Channel 11	Input Channel 01	Input Channel 10	Input Channel 00
1	Input Channel 17	Input Channel 07	Input Channel 16	Input Channel 06	Input Channel 15	Input Channel 05	Input Channel 14	Input Channel 04
2	Status Channel 07/17	Status Channel 06/16	Status Channel 05/15	Status Channel 04/14	Status Channel 03/13	Status Channel 02/12	Status Channel 01/11	Status Channel 00/10
3	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”

5.5.8 5 Bytes Input data + Diagnosis data Art.-No. 55299 (Left/Right format)

Table 5-9: Input data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 13	Input Channel 03	Input Channel 12	Input Channel 02	Input Channel 11	Input Channel 01	Input Channel 10	Input Channel 00
1	Status Channel 13	Status Channel 03	Status Channel 12	Status Channel 02	Status Channel 11	Status Channel 01	Status Channel 10	Status Channel 00
2	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”
3	Actuator disable Channel 17	Actuator disable Channel 07	Actuator disable Channel 16	Actuator disable Channel 06	Actuator disable Channel 15	Actuator disable Channel 05	Actuator disable Channel 14	Actuator disable Channel 04
4	always “0”	APS[4]	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”

If the APS-bit is set, the actuator supply is connected and the measured voltage > 18V

[4] APS = Aux Power Status (0=OFF, 1=ON)

5.5.9 Parametrization data Art.-No. 55297

Manufacturer specific format for output data and parameterization (Assembly entity 101)

Table 5-10: Output data for Art.-No. 55297

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
1	Make / Break Channel 07	Make / Break Channel 06	Make / Break Channel 05	Make / Break Channel 04	Make / Break Channel 03	Make / Break Channel 02	Make / Break Channel 01	Make / Break Channel 00
2	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10

The make / break function does only affect a function input. If Pin 2 is a Desina input, this parameter will not affect the transmitted input value of Pin 2.

5.5.10 Output data + parameterization data Art.-No. 55298

Manufacturer specific format for output data and parameterization

Table 5-11: Output data for Art.-No. 55298

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
1	Make / Break Channel 07	Make / Break Channel 06	Make / Break Channel 05	Make / Break Channel 04	Make / Break Channel 03	Make / Break Channel 02	Make / Break Channel 01	Make / Break Channel 00
2	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10
3	Input / Output Channel 07	Input / Output Channel 06	Input / Output Channel 05	Input / Output Channel 04	Input / Output Channel 03	Input / Output Channel 02	Input / Output Channel 01	Input / Output Channel 00
4	Output value Channel 07	Output value Channel 06	Output value Channel 05	Output value Channel 04	Output value Channel 03	Output value Channel 02	Output value Channel 01	Output value Channel 00

The make / break function does only affect a function input. If Pin 2 is a Desina input, this parameter will not affect the transmitted input value of Pin 2.

5.5.11 7 Bytes output data + parameterization data Art.-No. 55299 (Default)

Assembly entity 108 is a standard assignment for the I/O connections.

Table 5-12: Output data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
1	Make / Break Channel 07	Make / Break Channel 06	Make / Break Channel 05	Make / Break Channel 04	Make / Break Channel 03	Make / Break Channel 02	Make / Break Channel 01	Make / Break Channel 00
2	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10
3	Input / Output Channel 07	Input / Output Channel 06	Input / Output Channel 05	Input / Output Channel 04	Input / Output Channel 03	Input / Output Channel 02	Input / Output Channel 01	Input / Output Channel 00
4	Input / Output Channel 17	Input / Output Channel 16	Input / Output Channel 15	Input / Output Channel 14	Input / Output Channel 13	Input / Output Channel 12	Input / Output Channel 11	Input / Output Channel 10
5	Output value Channel 07	Output value Channel 06	Output value Channel 05	Output value Channel 04	Output value Channel 03	Output value Channel 02	Output value Channel 01	Output value Channel 00
6	Output value Channel 17	Output value Channel 16	Output value Channel 15	Output value Channel 14	Output value Channel 13	Output value Channel 12	Output value Channel 11	Output value Channel 10

The make / break function does only affect a function input. If Pin 2 is a Desina input, this parameter will not affect the transmitted input value of Pin 2.

5.5.12 7 Bytes Output data + parametrization data Art.-No. 55299

In this format the output data preceed the parameterization.Standard assignment for I/O connection: Assembly entity 109.

Table 5-13: Output data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Output value Channel 07	Output value Channel 06	Output value Channel 05	Output value Channel 04	Output value Channel 03	Output value Channel 02	Output value Channel 01	Output value Channel 00
1	Output value Channel 17	Output value Channel 16	Output value Channel 15	Output value Channel 14	Output value Channel 13	Output value Channel 12	Output value Channel 11	Output value Channel 10
2	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
3	Make / Break Channel 07	Make / Break Channel 06	Make / Break Channel 05	Make / Break Channel 04	Make / Break Channel 03	Make / Break Channel 02	Make / Break Channel 01	Make / Break Channel 00
4	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10
5	Input / Output Channel 07	Input / Output Channel 06	Input / Output Channel 05	Input / Output Channel 04	Input / Output Channel 03	Input / Output Channel 02	Input / Output Channel 01	Input / Output Channel 00
6	Input / Output Channel 17	Input / Output Channel 16	Input / Output Channel 15	Input / Output Channel 14	Input / Output Channel 13	Input / Output Channel 12	Input / Output Channel 11	Input / Output Channel 10

The make / break function does only affect a function input. If Pin 2 is a Desina input, this parameter will not affect the transmitted input value of Pin 2.

5.5.13 2 Bytes Output data Art.-No. 55299

Table 5-14: Output data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Output value Channel 07	Output value Channel 06	Output value Channel 05	Output value Channel 04	Output value Channel 03	Output value Channel 02	Output value Channel 01	Output value Channel 00
1	Output value Channel 17	Output value Channel 16	Output value Channel 15	Output value Channel 14	Output value Channel 13	Output value Channel 12	Output value Channel 11	Output value Channel 10

5.5.14 2 Bytes Output data Art.-No. 55299 (Left / Right format)

Table 5-15: Output data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Output Channel 13	Output Channel 03	Output Channel 12	Output Channel 02	Output Channel 11	Output Channel 01	Output Channel 10	Output Channel 00
1	Output Channel 17	Output Channel 07	Output Channel 16	Output Channel 06	Output Channel 15	Output Channel 05	Output Channel 14	Output Channel 04

5.5.15 1 Byte Output data Art.-No. 55299 (Left /Right format)

Table 5-16: Output data for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Output Channel 17	Output Channel 07	Output Channel 16	Output Channel 06	Output Channel 15	Output Channel 05	Output Channel 14	Output Channel 04

5.6 Selection of the I/O data length at Art.-No. 55299

The MVK-MDN module (Art.-No. 55299) enables selection of 8 different I/O data formats. The selection can be made by through the configuration software (e.g. RSNetworx) or manually through the object directory. However, the latter should only be used if a configuration software is not available or if the available configuration software does not support the DeviceNet-EDS-files.

The following data formats are available:

- 2 bytes input data and 2 bytes output data; no diagnosis. See chapters 5.5.4 and 5.5.13.
- 2 bytes input data and 2 bytes output data; no diagnosis. Pin 2 and Pin 4 of the respective connector in adjacent bits; no input data. See chapters 5.5.5 and 5.5.14.
- 10 bytes input and diagnosis bytes; 7 bytes output and parameterization bytes (Default adjustment). See chapters 5.5.3 and 5.5.11.
- 10 bytes input and diagnosis bytes; 7 bytes output and parameterization bytes. In this format, the output data are contained in bytes 0 and 1. Furthermore, this format is identical to the default admustment. See chapters 5.5.3 and 5.5.12.
- 2 bytes output data; Pin 2 and Pin 4 of the respective connector are in adjacent bits; no input data. See chapter 5.5.14.
- 3 input and diagnosis bytes; Pin 2 and Pin 4 of the respective connector are in adjacent bits; no output bytes. See chapter 5.5.6.
- 4 input and diagnosis bytes Pin 2 and Pin 4 of the respective connector are in adjacent bits; no output bits. See chapter 5.5.7.
- 5 input and diagnosis bytes and one output byte; Pin 2 and Pin 4 of the respective connector are in adjacent bits. See chapter 5.5.8.

Changing the I/O formats with RSNetworx is described below.

① Scan the network with RSNetworx and open the module window.

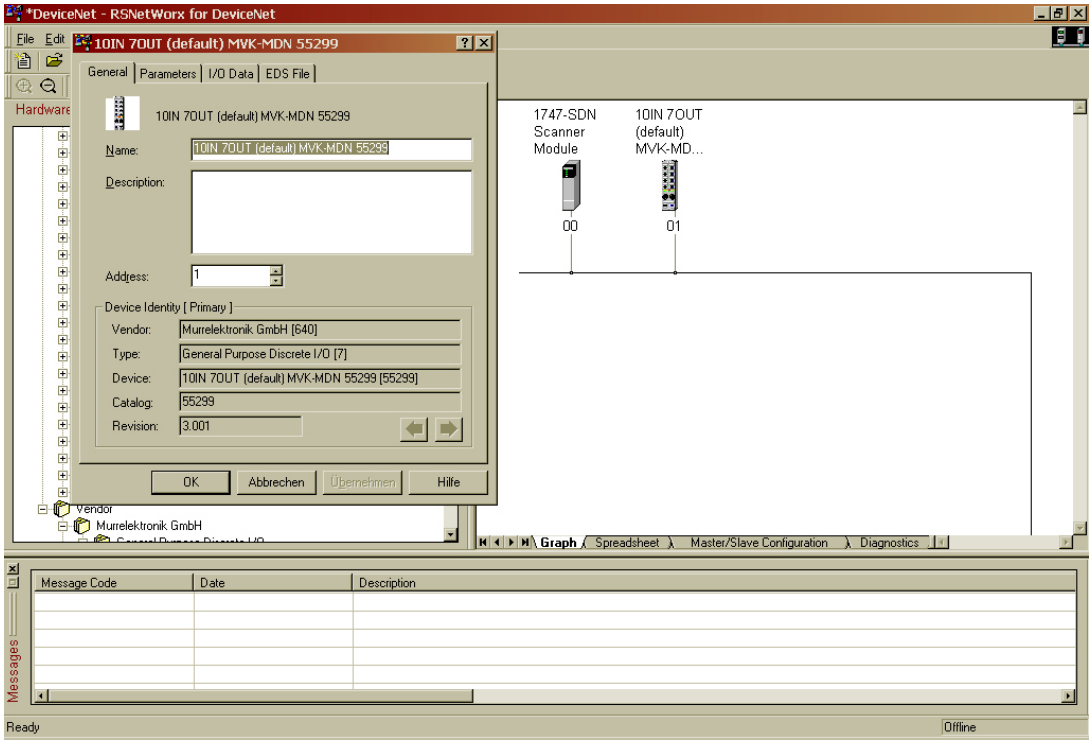


Figure 5-3: Default configuration of MVK-MDN Art.-No. 55299

② Click the tap „Parameter“ and select the parameter „Data Size & Format“. Make a choice out of the list that opens and confirm with „Übernehmen“ (accept).

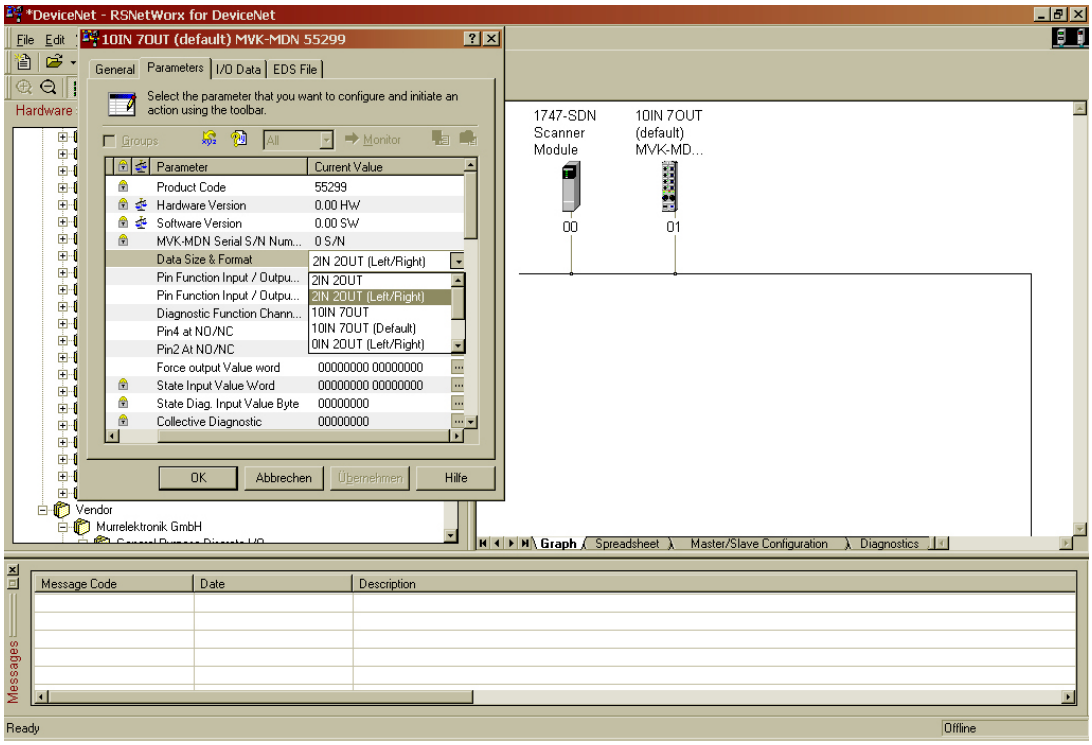
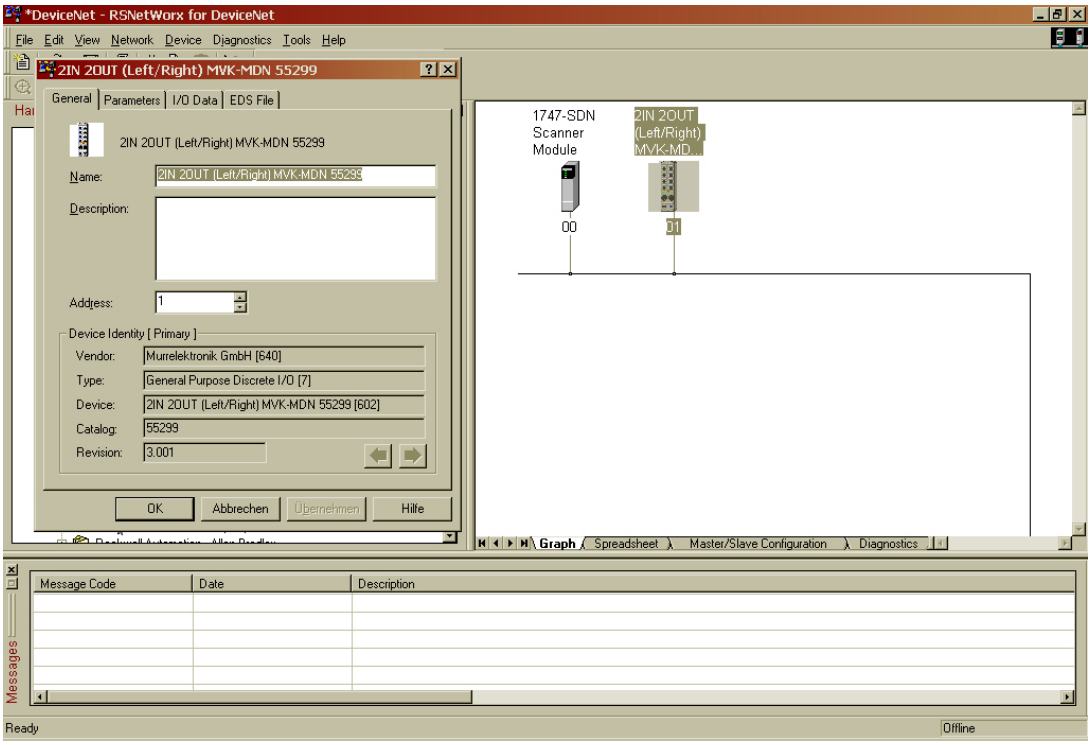


Figure 5-4: Changing the data length

The change will be adopted and written in the unit. The new configuration will automatically be stored in the MVK-MDN [5]. The MVK-MDN will then re-start, which you can notice at the self-test of the unit (MS/NS-LED blinks green/red in short intervals).

③ A new scan of the network is necessary. In this scan, the MVK-MDN will be recognized with the new data format, which can be seen at the description.

If the data format and the data length are being changed, the module looses its former parameterization and starts with the default values. Therefore the conversion of the data format must always be done at first!



④ Now the unit can be parameterized as usual.

[5] Dependent on the configuration software. Partially the storage of the parameters must be done manually (e.g. when using the OMRON DeviceNet configurators).

5.7 Device parameterization

There are several possibilities for the parameterization of MVK-MDN modules. The table below shows how to access the data and where they can be found.

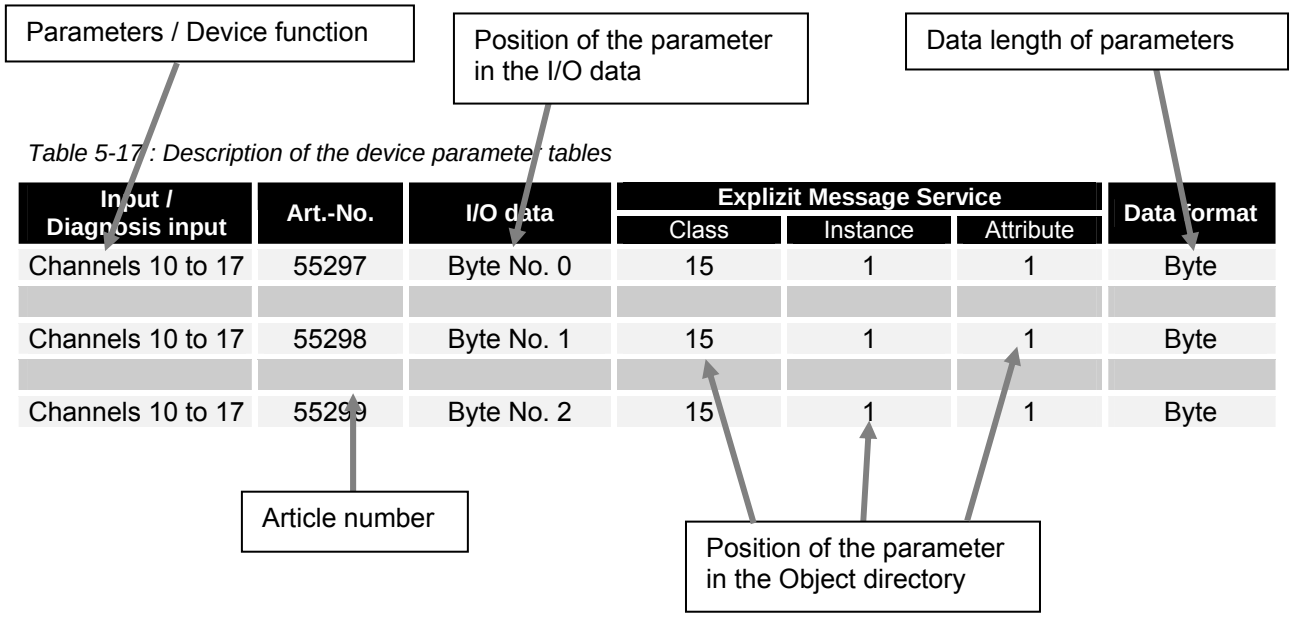

Parameters / Device function
Position of the parameter in the I/O data
Data length of parameters
Article number
Position of the parameter in the Object directory

Table 5-17 : Description of the device parameter tables

Input / Diagnosis input	Art.-No.	I/O data	Explizit Message Service			Data format
			Class	Instance	Attribute	
Channels 10 to 17	55297	Byte No. 0	15	1	1	Byte
Channels 10 to 17	55298	Byte No. 1	15	1	1	Byte
Channels 10 to 17	55299	Byte No. 2	15	1	1	Byte

5.7.1 Parameterization of Inputs / Diagnosis inputs

Table 5-18 : Data access via I/O data and parameters class

Input / Diagnosis input	Art.-No.	I/O data	Explizit Message Service			Data format
			Cass	Instance	Attribut	
Channels 10 to 17	55297	Byte No. 0	15	1	1	Byte
Channels 10 bis 17	55298	Byte No. 1	15	1	1	Byte
Channels 10 bis 17	55299	Byte No. 2	15	1	1	Byte

Table 5-19 : Bit assignments Input / Diagnosis input, parameter byte channel 10 to 17

Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Table 5-20 :Value description Input / Diagnosis input parameter byte

Bit value	Signification
0	Input
1	Diagnosis input

5.7.2

5.7.3 Make (N.O.) / Break (N.C.) function of inputs

The Make (N.O.) / Break (N.C) function is only effective on a function input. If pin 2 is a Desina input, this parameter will not affect the transmitted input value of pin 2.

Table 5-21 : Data access via DeviceNet

Male / Break function	Art.-No.	I/O data	Explizit Message Service			Data format
			Class	Instance	Attribut	
Channels 0 to 7	55297	Byte No. 1	15	2	1	Byte
Channels 10 to 17		Byte No. 2	15	3	1	Byte
Channels 0 to 7	55298	Byte No. 2	15	2	1	Byte
Channels 10 to 17		Byte No. 3	15	3	1	Byte
Channels 0 to 7	55299	Byte No. 3	15	2	1	Byte
Channels 10 to 17		Byte No. 4	15	3	1	Byte

Table 5-22 : Bit assignments Make / Break function parameter byte channels 0 to 7

Bit	7	6	5	4	3	2	1	0
Channel	7	6	5	4	3	2	1	0

Table 5-23 : Bit assignments Make / Break function parameter byte channels 10 to 17

Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Table 5-24 : Value description Make / Break function parameter byte

Bit value	Signification
0	Make (N.O.)
1	Break (N.C.)

5.7.4 Parameterization Inputs / Outputs (Art.-No. 55298 and 55299)

Table 5-25 : Data access via DeviceNet

Input / Output	Art.-No.	I/O data	Explizit Message Service			Data format
			Class	Instance	Attribut	
Channels 0 to 7	55298	Byte No. 4	15	6	1	Byte
Channels 0 to 7	55299	Byte No. 5	15	6	1	Byte
Channels 10 to 17		Byte No. 6	15	9	1	Byte

Table 5-26 : Bit assignments Input / Output parameter byte channels 0 to 7

Bit	7	6	5	4	3	2	1	0
Channel	7	6	5	4	3	2	1	0

Table 5-27 : Bit assignments Input / Output parameter byte channels 10 to 17

Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Table 5-28 : Value description Input / Output paramter byte

Bit value	Signification
0	Input
1	Output

5.7.5 Faultvalue / Faultaction

With these two parameters you can determine the behaviour of outputs in case of a DeviceNet failure. The following errors are detected by the module :

- Physical bus error (bus communication error)
- Monitoring time for a link expired
- Release of a I/O link
- Idle I/O Message (transmitted output data length null)
- Incorrect I/O data length (output data length)
- Faulty DupMacTest (multiple MAC-ID on the network)
- Device reset via DeviceNet

Function of the parameters

The Faultaction attribute allows to determine the fault status of the output. The latter keeps its latest status or takes over the value of the Faultvalue attribute.

Table 5-29 : Function of the parameters Faultvalue / Faultaction

	Faultaction = 0	Faultaction = 1
Faultvalue = 0	The output uses the value of the Faultvalue attribute (0).	The output keeps its latest status, the Faultvalue attribute is ineffective
Faultvalue = 1	The output uses the value of the Faultvalue attribute (1).	The output keeps its latest status, the Faultvalue attribute is ineffective

Entries are made individually for each channel. Only the values One (1) and Zero (0) are authorized.

Table 5-30 : Data access via DeviceNet for the Faultaction parameter

Input / Output	Art.-No.	Explizit Message Service			Data format
		Class	Instance	Attribute	
Channels 0 to 7	55298	9	1 ... 8	5	Byte
Channels 0 to 7	55299	9	1 ... 8	5	Byte
Channels 10 to 17		9	9 ... 16	5	Byte

Table 5-31 : Data access via DeviceNet for the Faultvalue parameter

Input / Output	Art.-No.	Explizit Message Service			Data format
		Class	Instance	Attribute	
Channels 0 to 7	55298	9	1 ... 8	6	Byte
Channels 0 to 7	55299	9	1 ... 8	6	Byte
Channels 10 to 17		9	9 ... 16	6	Byte

5.7.6 Saving the parameterization

The parameterization is permanently saved in the memory of the device. To do so, the PLC configurator performs (with regard to the parameter class descriptor of the EDS file) a direct access to class 15, instance 0 by means of the Service Save (22_{Hex}).

5.7.7 Restoring default parameters

1. by means of the default setting of the EDS file

The default settings can be restored by writing the default values from the EDS file into the device. Only the nonvolative memory is overwritten by the default values.

2. by means of a device reset

The default settings are restored if you perform a device reset in class 1 instance 1 attribute 1 by means of the Reset Service (5Hex). The nonvolatile memory of the device will be totally deleted and the default values of the device written into this memory.

6 Step by step : startup example

6.1 Mechanical configuration

6.1.1 Module mounting

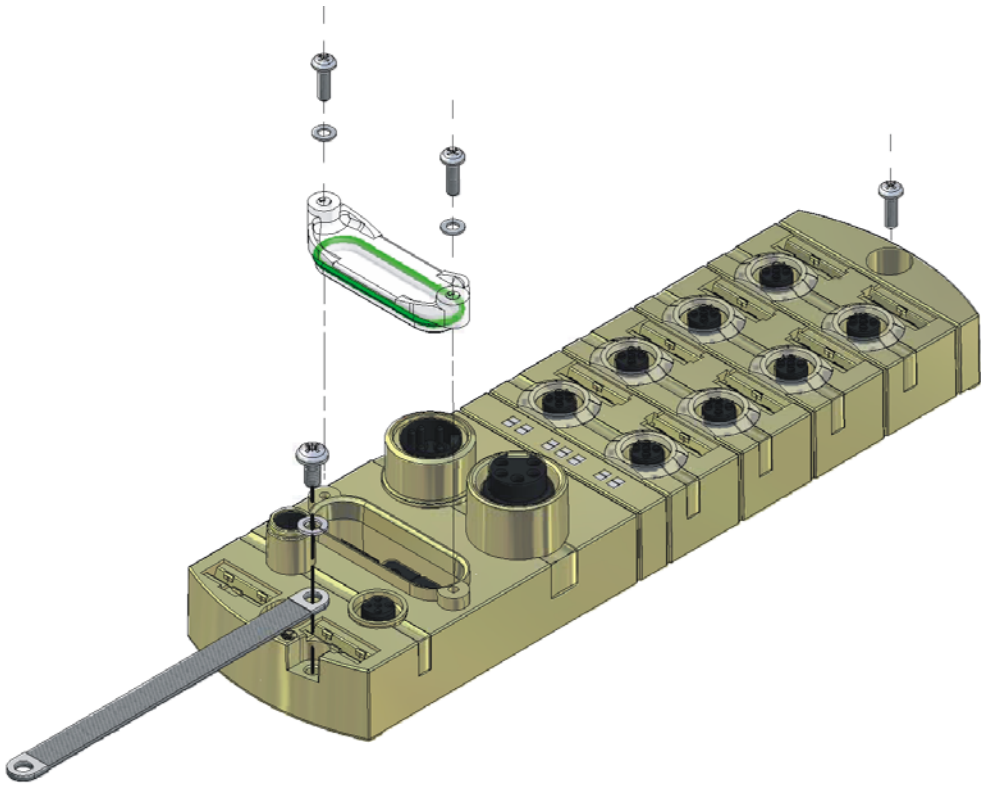


Fig. 6-1 : Step by step mounting of the module

❶ Basic module
❷ Code switch hood
❸ Fastening screws for the code switch hood
❹ NA - Node adresss switch, DR - Data rate switch
❺ Function ground connection
❻ M6 fastening screws

Step by step :

① Set the DeviceNet address and the baud rate using the two BCD switches ❹ in the basic module ❶.

② Mount the code switch hood ❷ on the basic module. Take care not to tilt the hood. Tighten the screws ❸ (torque : 0,1 + 0,1 Nm.

③ Connect the function ground on the botton side ❺ of the basic module ❶ .

④ Attach the basic module ❶ by means of the M6 screws ❻ on a flat mounting surface (torque : 8 Nm).

6.1.2 Connect system components

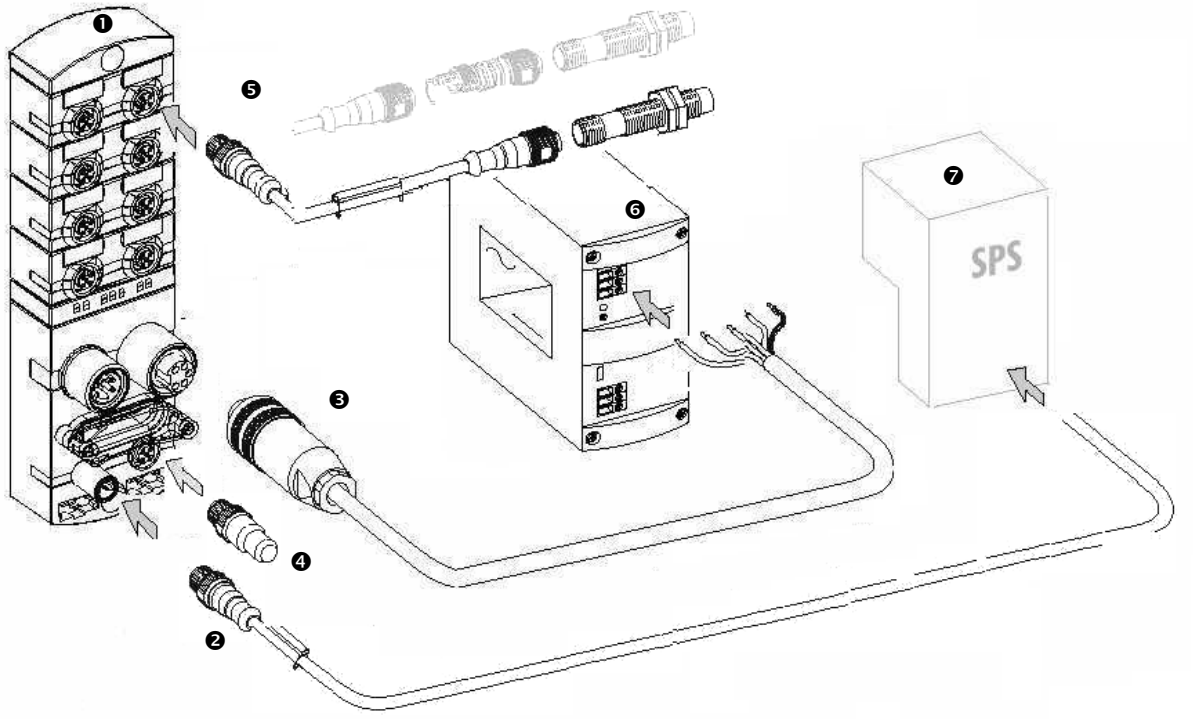


Fig. 6-2 : Connect system components

❶ Basic module
❷ Incoming DeviceNet bus line
❸ Power supply line
❹ DeviceNet terminating resistor

❺ M12 line to sensor or actuator
❻ Power supply unit
❼ Controller

Step by step :

① Connect M12 lines ❺ routed to the sensors or actuators to the basic module ❶.

② Connect the incoming DeviceNet bus line ❷ to the "Bus In" terminal on the basic module ❶.

③ Connect the outgoing DeviceNet bus line to the next DeviceNet user or, if the bus node is the last user, connect a terminating resistor ❹.

④ Connect the power sypply ❻ via a 7/8“ connector ❸.

6.2 Configuration with RSNetWorx from version 3.XX

Before proceeding with the setup, please be sure to read the operating instructions of all devices in use and their software !

CAUTION :
This manual illustrates the setup procedure with the above-mentioned soft- and hardware by way of example !

① First download the most current EDS files on the Internet on www.murrelektronik.com. In case you do not have Internet access, please contact our Technical Support.

② Connect one or more devices to the DeviceNet bus (assure professional setup of the field bus).

Always ensure that the baud rate setting is identical for all device in the DeviceNet network.

Always ensure that every DeviceNet participant has an unequivocal and unique address in the network.

③ Turn **all** the power supplies ON for the bus modules (check voltages prior to supplying participating bus modules).

④ The scanner (scanner and PLC voltage must be ON) first executes a self-test and displays a status message („80“ on the display). When the scanner has booted, „00“ and „75“ will blink alternately in the display.
In addition to this, two LEDs on the scanner also indicate the scanner status. These two LEDs display the DeviceNet bus status (OK or not OK) and module status (scanner errors, after scanner boot without participating module = green, net = green blinking). If participating modules are present on the bus, the status LEDs remain unchanged although „00“ and „76“ still alternately blink in the display.

⑤ The MVK-MDN modules now also display their module status with LEDs at the bus portion (MS = green and NS = green blinking).

⑥ Connect the KFD-Box[6] to the DeviceNet-Netzwerk and the PC and start the RSNetWorx software tool. Install the latest EDS files in RSNETWorx. A separate EDS-file is required for each MVK-MDN module
Check if the modules / bus elements have been correctly entered in the scan list of the scanner and check the I/O data length. Select an operating mode for the bus node or confirm the default operting mode "Poll".

[6] The KFD-Box is a connection group by Allen-Bradley for DeviceNet. The DeviceNet-Bus and ist units can be accessed by the RSNetworx Software of this KFD-Box.

⑦ Click on the task list of RSNetWorx and press the „Online“ button, then confirm several safety messages. The programm of the KFD-Box scans the network (Prior to that, you might have to adjust that scanning shall be done by the KFD-Box).

⑧ Once all of the participants have been recognized, proceed to the Symbol of the MVK-MDN in RSNetWorx. Check the configuration of the MVK-MDN and parameterize the module. Now make a complete download of the parameterization. The changes in parameters are stored non-volatile in the module.

⑨ Now proceed to the RSNetWorx scannersymbol. Check whether the I/O data lengths were entered correctly in the scanliste of the scanner. Select an operating mode for the MVK-MDN and confirm the default-operation-mode Poll.

⑩ Click on the register „Scanlist“ and confirm the button „Download“. Press the button „>>“ in the newly opened window and then the „Accept“ button. All MVK-MDN modules in the scan list are now in the scanner. The scanner builds an I/O connection to the modules. The NS-LED of the MVK-MDN is green. The PLC can access the MVK-MDN data according to the created scan list

6.3 Parameterization with RSNetWorx

RSNetWorx and the Murrelektronik EDS file provide all device-related information. Double-click the corresponding symbol to open a window with 4 taps. The „General“ tab (Fig. 6-3 : general device information) contains information used by the scanner to identify the configuration.

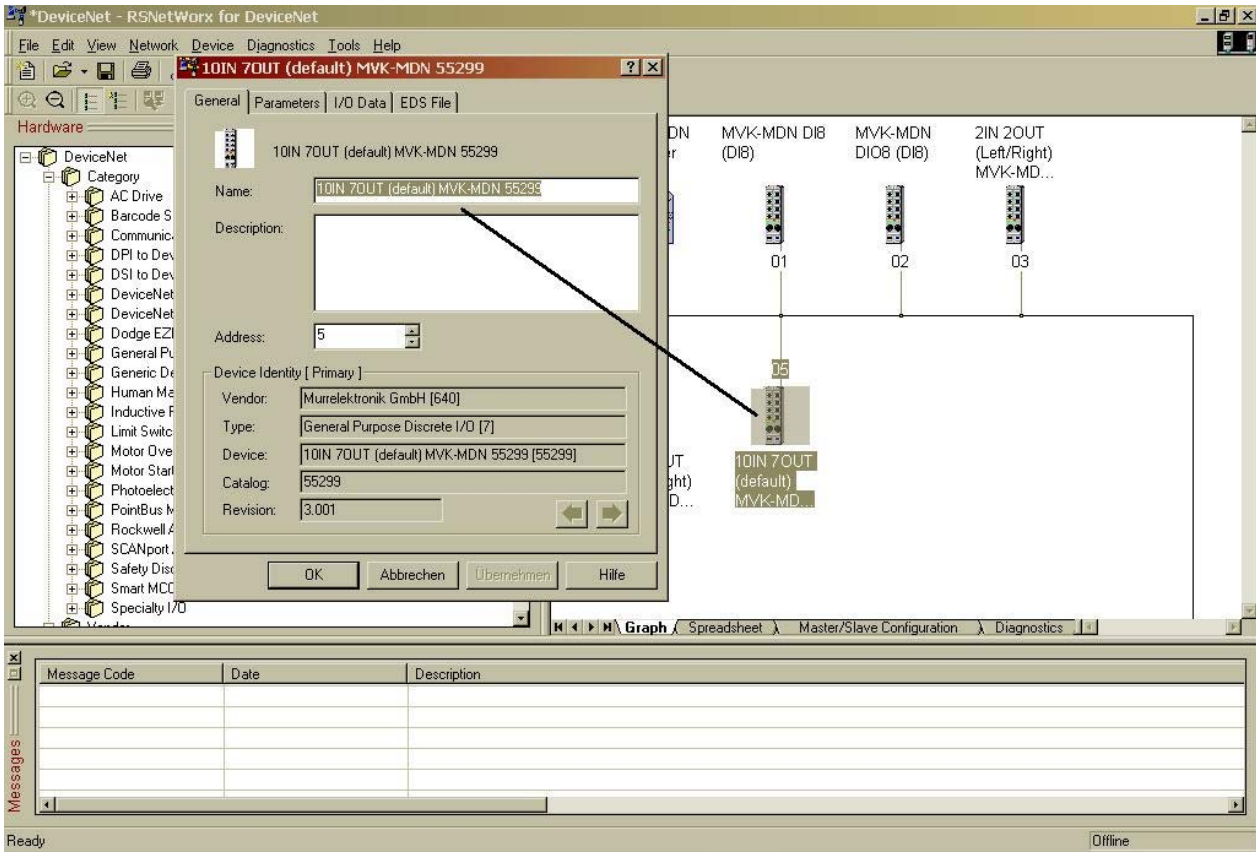


Fig. 6-3 : General device information

The tap “Parameter” (see **Fehler! Verweisquelle konnte nicht gefunden werden.**) shows all device parameters and diagnosis. By double-clicking on the desired parameter, it can be adapted channel-wise. Help texts will lead you to the correct settings.

If you would like to change the Data format of the MVK-MDN Art.-No. 55299, please see chapter 5.6 prior to parameterization.

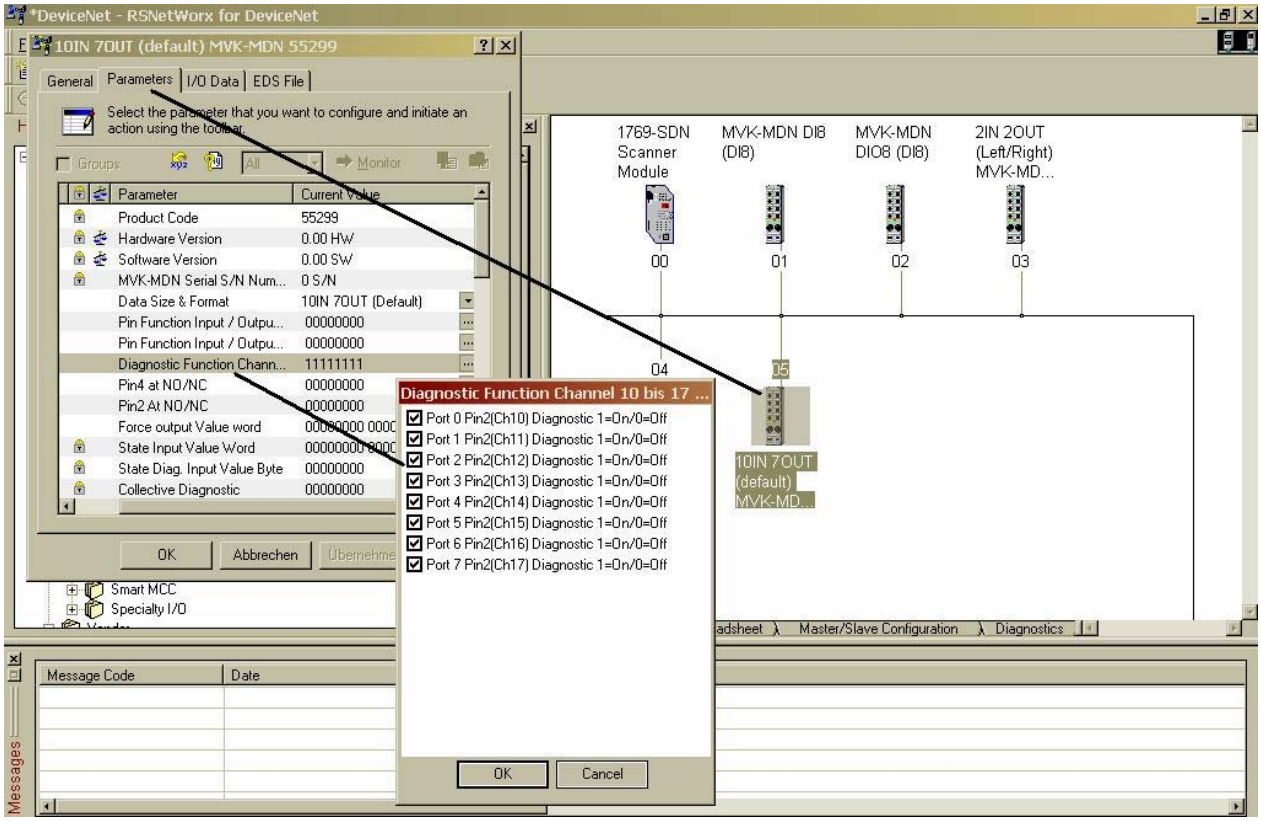


Figure 6-4: Parametrization access

Fig. 6-5 shows an example of global diagnosis MVK-MDN, indicating how to access detailed information concerning the device status.

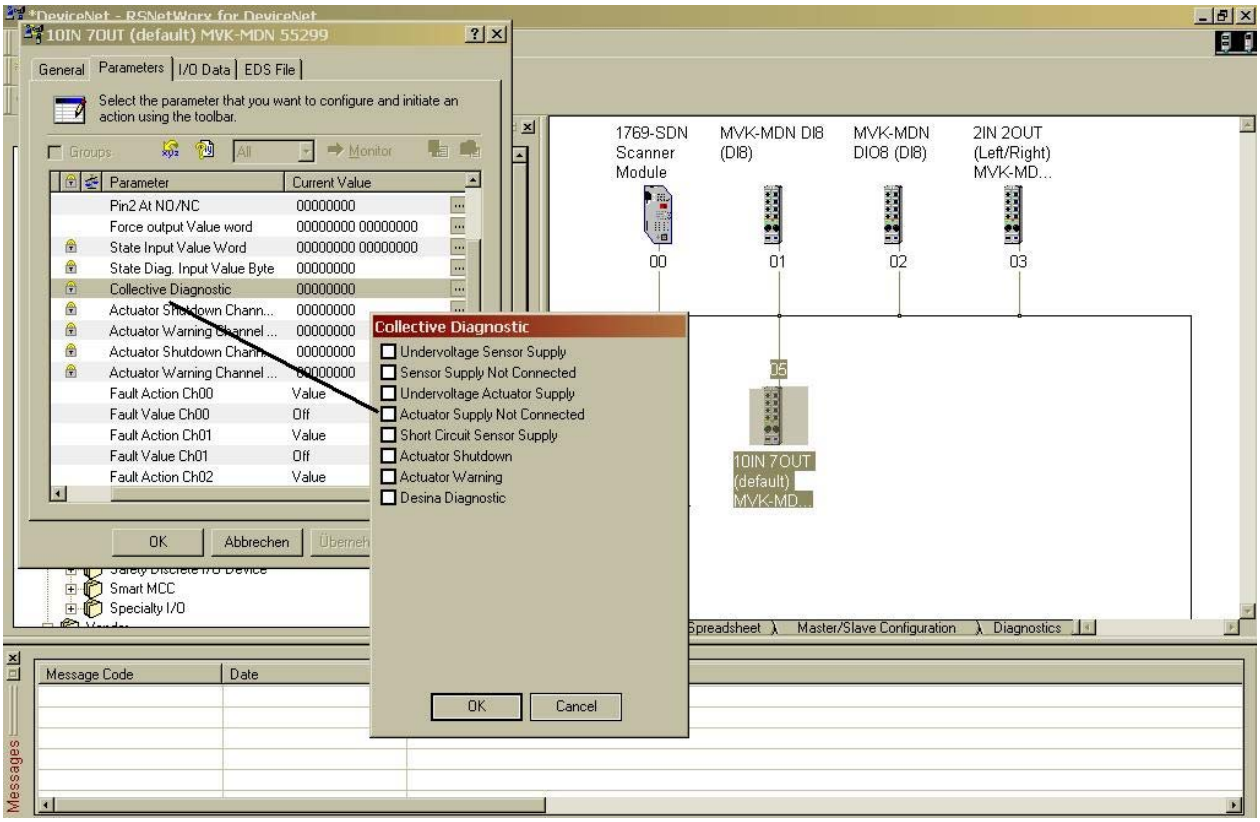


Fig. 6-5 : Diagnosis information

The Fig. below shows the I/O data length of the MVK-MDN stored in the EDS file as well as the set connection type.

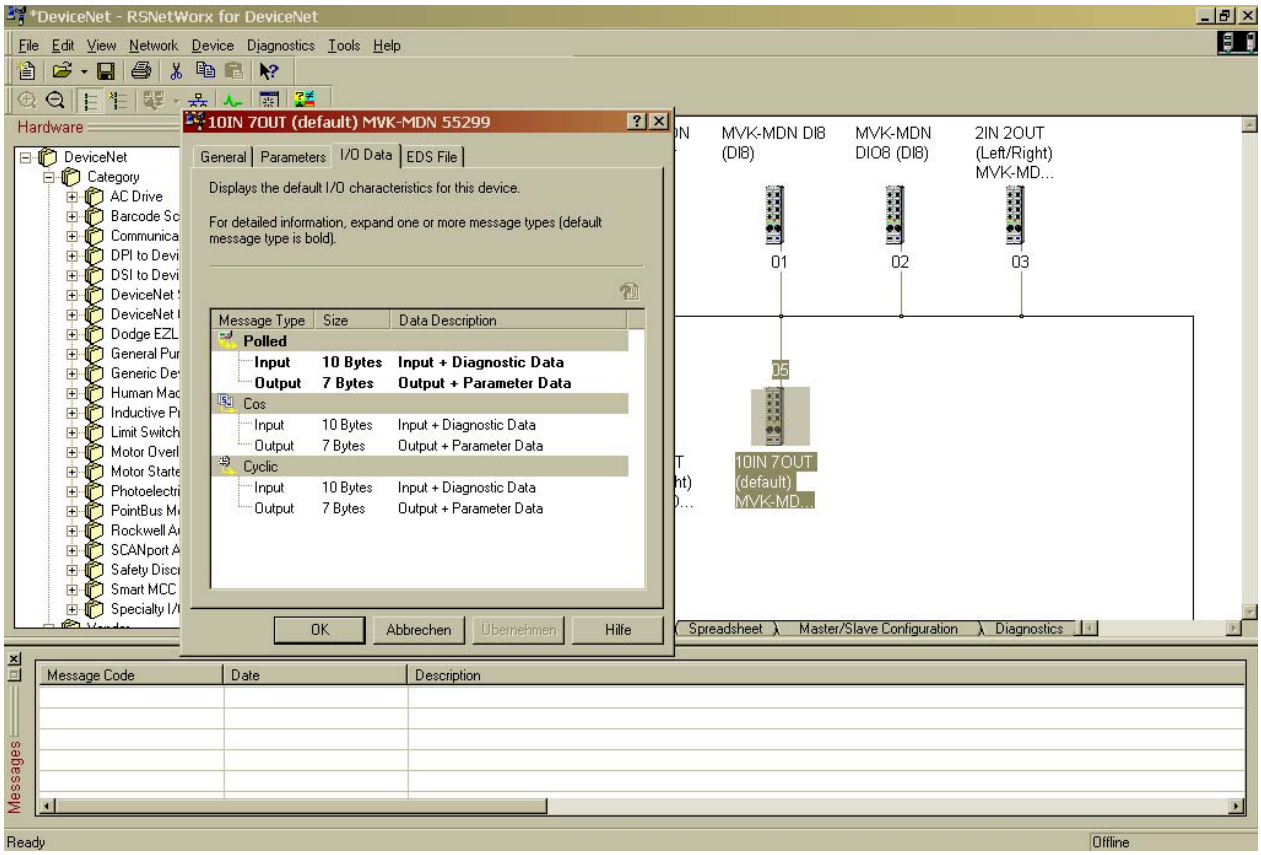


Fig. 6-6 : I/O data length from the EDS file

7 Diagnosis

Input and output data as well as supplementary diagnosis data are transmitted to the scanner for each MVK-MDN module.
Diagnosis data display the operating status of the module or of the sensor and actuator connections.
The diagnosis input is parameterizable via the I/O data.

7.1 DeviceNet status displays

The device performs a self-test as soon as the MVK-MDN is supplied via the bus. The self-test duration is approx. 2 sec. When the DupMac test is completed (a test to check if other modules with identical MAC-ID are present on the bus) the NS-LED flashes green. The DupMac test can only be terminated if at least one more user is present on the bus. In case of a faulty DupMac test, the module address must be corrected by means of the rotary switches.

Table 7-1 : Description of the DeviceNet displays

LED designation	LED display	Behavior	Signification
MS		OFF	Self-test not completed.
MS		Green	Self-test completed
NS		OFF	DupMac Check not completed ; no other bus user in the DeviceNet network
NS		Green flashing	DupMac Check completed, no link to the Master
NS		Green	Link to the Master (Explicit and / or I/O link)
NS		Red flashing	Linkt to the Master interrupted (Timeout, Bus connection interrupted)
NS		Red	Bus connection interrupted, general physical bus error (voltage reset required)

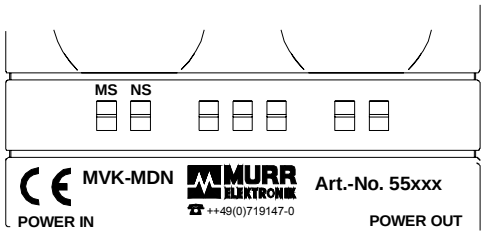


Fig. 7-1 : Location of the MS- and NS-displays in the housing

7.2 Displays for the status of sensor and actuator power supply

7.2.1 US - Power – LED displays

The US-LED displays the status of the sensor power supply. Make sure that sensors and module are supplied by the bus to get I/O signals and diagnosis displays.

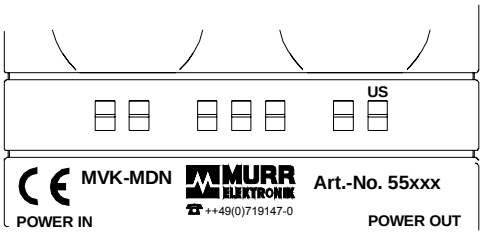


Fig. 7-2 : Location of the US display on the housing

Table 7-2 : Description of the US-LED displays

LED designation	LED display	Behavior	Signification	Status
U_S		Green	Sensor supply	Ok (> 18 V)
U_S		Red	Sensor supply	Undervoltage
U_S		OFF	Sensor supply	Not available (< 12 V)

7.2.2 UA - Power – LED displays

The UA-LED displays the status of the actuator power supply.

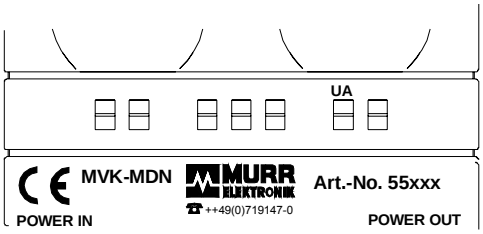


Fig. 7-3 : Location of the US display in the housing

Table 7-3 : Description of the UA-LED displays

LED designation	LED display	Behavior	Signification	Status
U_A		Green	Actuator supply	Ok (> 18 V)
U_A		Red	Actuator supply	Undervoltage
U_A		OFF	Actuator supply	Not available (< 12 V)

7.3 I/O-Status and diagnosis displays

Each input and output is allocated a separate status display which is labeled '00...07'. It is located next to the corresponding M12 socket ; this simplifies status assignment of peripheral components such as sensors and actuators.
All M12 sockets are assigned a second LED which, depending upon how the input was parametered, displays the diagnostic status (red illuminated, default) or the additional function input status (yellow illuminated). These LED‘s are marked '10...17'.

7.3.1 Relationship between signal-logical representation and LED response

Table 7-4 : Relationship between signal-logical representation and LED response - Input

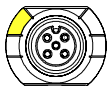
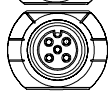
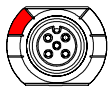
Input with make funtion	Voltage at input	Logical value	LED display[7]	
	0 V	0		OFF
	24 V	1		yellow
Input with break funtion	0 V	1		OFF
	24 V	0		yellow
Diagnosis input	0 V	1		red
	24 V	0		OFF

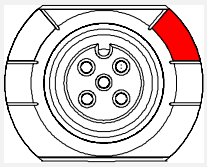
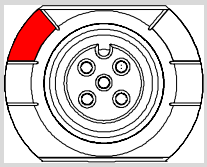
Table 7-5 : Relationship between signal-logical representation and LED response - Output

Output	Logical value	Voltage at output	LED display	
	0	0 V		OFF
	1	24 V		yellow

[7] If a channel-related diagnosis is available, the LED assigned to this channel is continuously lit red.

7.3.2 M12 sockets - LED Diagnosis displays

Table 7-6 : M12 sockets – LED Diagnosis Displays

LED display	Voltage at channels 00..07	Voltage at channels 10..17	Diagnosis at channels 00..07	Diagnosis at channels 10..17
	0 V	0 V	-	External fault
	0 V	0 V	-	Sensor short-circuit
	0 V	0 V	-	Actuator disabled
	0 V	24 V	-	Actuator warning
	-	0 V	-	-
	0 V	0 V	Sensor short-circuit	-
	0 V	0 V	Sensor short-circuit	-
	24 V	0 V	Actuator warning	-

7.3.3 Deleting / suppressing diagnosis

7.3.3.1 External error (with sensors/actuators which meet the DESINA specification)

Error on the connected sensor or the link to the sensor. Replace the sensor or the link. If the diagnosis input is not used, the parameterization as an input allows to suppress the diagnosis. For more information see chap. 7.4 DESINA Diagnosis input and Chap. 5.6. Device parameterization.

7.3.3.2 Sensor short circuit

Short circuit or overload at the sensor power supply of this input channel. Eliminate the cause of the fault. The sensor short circuit will not be displayed if the channel has been parameterized as an output.

7.3.3.3 Actuator disabled

The connected actuator or the link to the actuator cause a short circuit / overload on the output driver.
As soon as the cause of the fault is eliminated, the actuator is re-enabled by a voltage reset of the actuator power supply or a reset of the output channel via the PLC.

7.3.3.4 Actuator warning

The output channel is supplied by a voltage of approx. > 11 V.
The display disappears as soon as the cause of the problem is eliminated.

7.4 DESINA diagnosis input

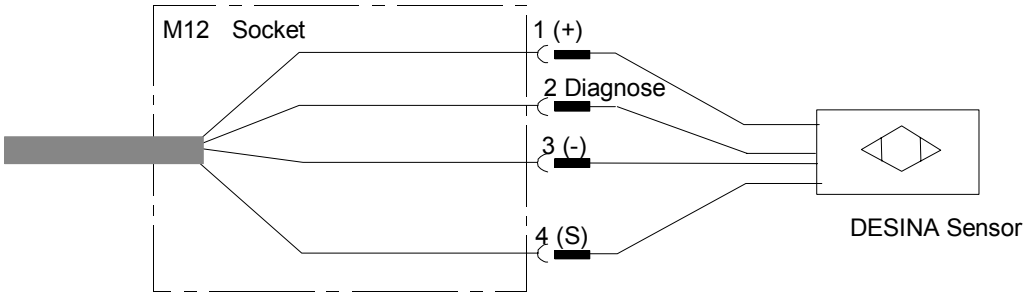
In all modules, Pin 2 of the M12 socket can be parameterized as diagnostic input. If the 0 V signal is present at a diagnosis input, this signal is displayed in an inverted form in the process image. At the same time, a channel-related diagnosis message is issued via the DP diagnostics.

7.4.1 Examples of the application of the DESINA diagnosis function of pin 2

Pin 2 basically behaves like an inverted input when it is parameterized as a diagnosis input.
The special thing about Pin 2 is that the assigned LED lights up red when a voltage of 0 V -> logical "1" is present. It is therefore possible to indicate faults of external devices at MVK-MDN. Several suggestions are given in the following.

7.4.2 Connecting sensors/actuators with diagnosis output

Imagine you are using a sensor or an actuator with diagnosis output. You can also evaluate this diagnosis signal, and process and represent it in the controller or visualization unit using a conventional I/O system. However, you have no visual fault display in the proximity of the defects sensor, which is probably also fitted in a concealed location. Visual indication at the M12 socket of the MVK-MDN also facilitates accurate on-site fault localization.



Detection of :

- *Damage to the end face*
- *Defective electronics*
- *Wire breakage*

Fig. 7-4 : Connecting sensors/actuators with diagnosis output

7.4.3 Monitoring a line for line breakage

Murrelektronik GmbH supplies the M12 diagnosis adapter with a simple accessory which helps you to monitor M12 lines to the sensors or actuators of your system for line breakage. The diagnosis adapter is attached to the sensor/actuator.

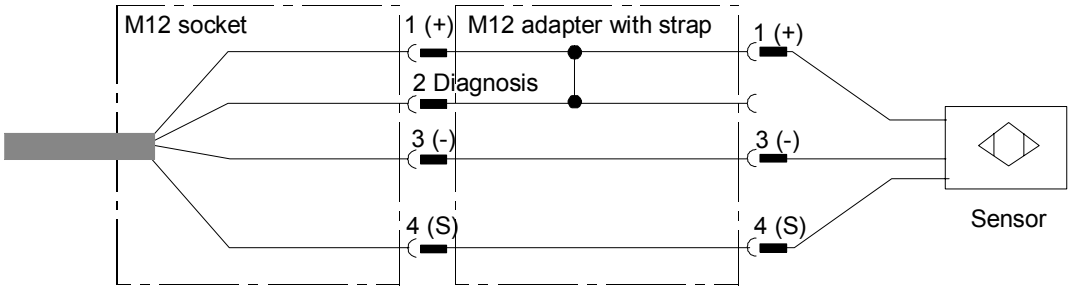


Fig. 7-5 : Monitoring a line for line breakage

7.5 Diagnosis information

7.5.1 Global diagnosis

Table 7-7 : Global diagnosis assignments

Bit	Signification
0	Undervoltage sensor power supply (> 12,5 V < US < 17,0 V)
1	Sensor power supply not connected (<12,0 V)
2	Undervoltage actuator power supply (> 12,5 V < UA < 17,0 V) (not for Art.-No. 55297)
3	Actuator power supply not connected (<12,0 V) (not for Art.-No. 55297)
4	Sensor short circuit
5	Actuator disabled (not for Art.-No. 55297)
6	Actuator warning (not for Art.-No. 55297)
7	Desina diagnosis

Global diagnosis is made up of one byte. The correspondig bit for an error is activated if the error occurs and it is deactivated as soon as the fault has been rectified.

Table 7-8 : Global diagnosis via DeviceNet

Global diagnosis	I/O Data	Explizit Message Service			Data format
		Class	Instance	Attribute	
all channels	Byte No. 4	15	4	1	Byte

7.5.2 Diagnosis for the sensor power supply

In global diagnosis two bits are provided for the status of the sensor supply voltage.
If no sensor power supply is connected, no input signals and diagnosis messages and no outputs are activated.

The sensor power supply must be connected to assure regular I/O operation of the module. The bus part can operate without sensor supply.

Diagnosis displays and messages do not depend on the parameterization of the device.

7.5.3 Diagnosis for the actuator power supply

In global diagnosis two bits are provided for the status of the actuator supply voltage.
If no actuator power supply is connected, no outputs are activated.

Diagnosis displays and messages do not depend on the parameterization of the device.

The connection of the actuator power supply is not necessary for Art.-No. 55297. However, the device will not be damaged if you connect an actuator supply.

7.5.4 Short circuit of sensor supply at M12 socket

The status LED of the channel lights up red. The sensor short circuit for this channel will not be displayed if the channel has been parameterized as an output.

The status bit for this channel is activated in the I/O data. The status bit is also accessible via Class 8 Instance 1 to 16 Attribute 4. The bit is activated in the global diagnosis. The status bit and the global diagnosis will not be activated if the channel has been parameterized as an output.
Since only one sensor supply is provided for two input channels, two status bits are always activated per M12 socket.

7.5.5 Desina diagnosis for the channels 10 to 17

The diagnosis input behaves like an inverted input. The status display of the channel lights up red.

The Desina diagnosis is displayed for the channels 10 to 17, if these are paramaterized as diagnosis inputs. Channel-related parameterization is possible via the I/O data or via Class 15 Instance 1 Attribute 1. In this case, the diagnosis value is identical to the input data for the channels 10 to 17. The bit is activated in the global diagnosis if a diagnosis is present. Changing the parameterization of the channels 10 to 17 allows to disable the Desina diagnosis. The Desina diagnosis will not be displayed in case of a short circuit at the channel.

Table 7-9 : Desina diagnosis via DeviceNet

Desina diagnosis	I/O Data	Explizit Message Service			Data format
		Class	Instance	Attribute	
Channels 10 to 17	Byte No. 5	15	5	1	Byte

Table 7-10 : Bit assignments for Desina diagnosis, channels 10 to 17

Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Table 7-11 : Value description, Desina diagnosis

Bit value	Signification
0	no error
1	Desina diagnosis

7.5.6 Actuator disabled (only for Art.-No. 55298 and 55299)

Actuator disabled is displayed in case of a short-circuit after Ground at the channel parameterized as an output. The status display of the channel lights up red.
The output is not automatically re-enabled after eliminating the cause of the fault. The actuator supply voltage must be reset or the output must be reinitialized via the controller.
Channel-related diagnosis via the I/O data ; it is also accessible via Class 9 Instance 1 to 16 Attribute 4, or as a complete Byte for the channels 0 to 7 via Class 15 Instance 7 Attribute 1 and for the channels 10 to 17 via Class 15 Instance 10 Attribute 1.

Table 7-12 : Actuator disabled via DeviceNet

Actuator disabled	I/O Data	Explizit Message Service			Data format
		Class	Instance	Attribute	
Channels 0 to 7	Byte No. 6	9	1 to 8	3	Status bit
		15	7	1	Byte
Channels 10 to 17 *(only for Art.-No. 55299)*	Byte Nr. 8	9	9 to 16	3	Status bit
		15	10	1	Byte

Table 7-13 : Bit assignments, actuator disabled, channels 0 to 7

Bit	7	6	5	4	3	2	1	0
Channel	7	6	5	4	3	2	1	0

Table 7-14 : Bit assignments, actuator disabled, channels 10 to 17

Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Table 7-15 : Value description, actuator disabled

Bit value	Signification
0	no error
1	Actuator disabled

7.5.7 Actuator warning (only for Art.-No. 55298 and 55299)

Actuator warning is displayed if a voltage > 11 V is detected at the channel parameterized as an output. The status display lights up red. This error status is detected if the output is disabled.
Channel-related diagnosis via the I/O data ; it is also accessible as a complete byte for the channels 0 to 7 via Class 15 Instance 8 Attribute 1 and for the channels 10 to 17 via Class 15 Instance 11 Attribute 1.

Table 7-16 : Actuator warning via DeviceNet

Actuator warning	I/O Data	Explizit Message Service			Data format
		Class	Instance	Attribute	
Channels 0 to 7	Byte No. 7	15	8	1	Byte
Channels 10 to 17 *(only for Art.-Nr. 55299)*	Byte Nr. 9	15	11	1	Byte

Table 7-17 : Bit assignments, actuator warning, channels 0 to 7

Bit	7	6	5	4	3	2	1	0
Channel	7	6	5	4	3	2	1	0

Table 7-18 : Bit assignments, actuator warning, channels 10 to 17

Bit	7	6	5	4	3	2	1	0
Channel	17	16	15	14	13	12	11	10

Table 7-19 : Value description, actuator warning

Bit value	Signification
0	no error
1	Actuator warning

8 DeviceNet classes

Table 8-1 : DeviceNet classes – Device profile

Class	Name	Instance	Instance designation
1	Identity Object	0	Class instance
		1	Identity Object Instance
2	Message Router Object	0	Class instance
4	Assembly Object	0	Class instance
		5	16 bit inputs
		25	16 bit inputs + status bit for each input
		34	8 bit outputs, channels 0 to 7
		35	16 bit outputs, channels 0 to 17
		44	8 bit actuator disabled channels 0 to 7
		45	16 bit actuator warning outputs channels 0 to 17
		100	Manufacturer specific format
		101	Manufacturer specific format
		102	Manufacturer specific format
		103	Manufacturer specific format
		104	Manufacturer specific format
		105	Manufacturer specific format
		106	Manufacturer specific format
		107	Manufacturer specific format
		108	Manufacturer specific format
		109	Manufacturer specific format
		110	Manufacturer specific format
		111	Manufacturer specific format
5	Connection Object	0	Class instance
		1	M / S predefined connection set – Explicit Message
		2	M / S predefined connection set – Polled
		3	M / S predefined connection set – Change of State
		4	M / S predefined connection set – Cyclic

Class	Name	Instance	Instance designation
8	Digital Input Class	0	Class instance
		1	Instance input channel 0
		2	Instance input channel 1
		3	Instance input channel 2
		4	Instance input channel 2
		5	Instance input channel 3
		6	Instance input channel 4
		7	Instance input channel 5
		8	Instance input channel 6
		9	Instance input channel 7
		10	Instance input channel 10
		11	Instance input channel 11
		12	Instance input channel 12
		13	Instance input channel 13
		14	Instance input channel 14
		15	Instance input channel 15
		16	Instance input channel 16
9	Digital Output Class	0	Class instance
		1	Instance output channel 0
		2	Instance output channel 1
		3	Instance output channel 2
		4	Instance output channel 3
		5	Instance output channel 4
		6	Instance output channel 5
		7	Instance output channel 6
		8	Instance output channel 7
		9	Instance output channel 10
		10	Instance output channel 11
		11	Instance output channel 12
		12	Instance output channel 13
		13	Instance output channel 14
		14	Instance output channel 15
		15	Instance output channel 16
		16	Instance output channel 17

Class	Name	Instance	Instance designation
15	Parameter Class	0	Class instance
		1	Parameter Input / Diagnosis
		2	Parameter Make / Break channels 0 to 7
		3	Parameter Make / Break channels 10 to 17
		4	Global diagnosis
		5	Channel-related Desina diagnosis
		6	Parameter Input / Output channels 0 to 7
		7	Actuator disabled channels 0 to 7
		8	Actuator warning channels 0 to 7
		9	Parameter Input / Output channels 10 to 17
		10	Actuator disabled channels 10 to 17
		11	Actuator warning channels 10 to 17
43	Acknowledge Handler Object	0	Class instance
		1	Acknowledge Handler Instance

8.1 Class 1 Identity Object

8.1.1 Attributes of class 1 instance 0

Table 8-2 : Instance 0 in class 1

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Revision	UINT	Revision of the Identity Object Class Definition	1
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The largest instance number of a created object at this class hieraychy level

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).
Access to class attributes can be made with the following service.

Table 8-3 : Supported service for instance 0 class 1

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.1.2 Attributes of class 1 instance 1

The instance attributes listed in the following table have been implemented for the instance "Identity Object".

Table 8-4 : Instance 1 class 1

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Vendor ID	UINT	Idenfication of each vendor by number	640 (280_{Hex})
2	Get	Device Type	UINT	Indication of general type of product	Generic I/O Modul (7_{Hex})
3	Get	Product Code	UINT	Idenfication of a particular product of an individual	55299
4	Get	Revision	STRUCT of	Revision of the item the Identity Object represents	
		Major Revision	USINT		02
		Minor Revision	USINT		01
5	Get	Status	WORD	Summary Status of device	gemäß Spec.
6	Get	Serial Number	UDINT	Serial number of device	Entspricht Seriennummer
7	Get	Product Name	SHORT_ STRING	Human readable identification	MVK-MDN DIO8 (DIO8)
10	Get / Set	Heartbeat Interval	USINT	The nominal interval between heartbeat messages in seconds	00
101	Set	Serial number	UDINT	Setting of the serial number for setup and production	e.g. : 0x23456789
102	Get	HW Number	USINT	HW Stand	100
103	Get	SW Number	USINT	SW Stand	100

The optional instance attributes 8 and 9 are not supported and rejected with the error message *Attribut not supported* (14_{Hex}).
Access to class attributes can be made with the following services.

Table 8-5 : Supported services for instance 1 class 1

Service Code	Service Name	Description of Service
05_{Hex}	Reset	0 = Reset 1 = Reset with loading Default parameter
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.2 Class 2 Message Router Object

The Message Router Object directs explicit messages to the corresponding objects. This object has neither attributes nor services.

8.3 Class 3 DeviceNet Object

The DeviceNet Object contains general communication specific device characteristics.
The code switches read the device address and the baud rate once when the MVK-MDN is turned on. Address and baud rate are only stored temporarily in the RAM.

8.3.1 Attributes of class 3 instance 0

Table 8-6 : Instance 0 class 3

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Revision	UINT	Revision of the Identity Object Class Definition	2

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).

Access to class attributes can be made with the following service.

Table 8-7 : Supported service for instance 0 class 3

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

8.3.2 Attributes of class 3 instance 1

The instance attributes listed in the following table have been implemented for the instance "DeviceNet Object".

Table 8-8 : Instance 1 class 3

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	MAC ID	USINT	Node Adress	Range 0 – 63
2	Get	Baud Rate	USINT	Baud Rate	Range 0 – 2
3	Get / Set	BOI	BOOL	Bus Off Interupt	Range 0 - 1
4	Get / Set	Bus Off Counter	USINT	Number of times CAN went to the bus off state	Range 0 – 255
5	Get	Allocation Information	STRUCT of		
		Allcation Choice Byte	BYTE		
		Master's MAC ID	USINT	MAC ID if Master (from allocated)	

If invalid values are set at the baud rate and/or MAC ID switches, the following values are used :
- **MAC ID = 63,**
- **Baud rate = 125 kBit/s.**

The optional class attributes 6 to 9 are not supported and rejected with the error message *Attribut not supported* (14_{Hex}).

Access to class attributes can be made with the following services.

Table 8-9 : Supported services for instance 1 class 3

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value
$4B_{Hex}$	Allocate_Master / Slave_Connection_Set	Request the use of the Predefined Master / Slave Connection Set
$4C_{Hex}$	Release_Group_2_Identifier	Indicates that the specified Connections within the Predefined Master / Slave Connevtion Set are no longer desired. These Connections are to be released (Deleted)

Set access to attributes 1 and 2 are acknowledged with the error message *Attribut not settable*.

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4 Assembly Object (Class ID 4)

Several instances are supported for I/O data. All I/O data are read or written via attribute 3 of the corresponding instance. The I/O data enable the device parameterization.

Table 8-10 : I/O data access via attribute 3

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
3	Get	Input data	ARRAY OF BYTE	Assembly input data	{0, 0, 0 ....}

8.4.1 Instance 0 class 4

Table 8-11 : Class 4 instance 0

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Revision	UINT	Revision of the Identity Object Class Definition	2

Optional class attributes are not supported and rejected with the error message *Attribut not supported* (14_{Hex}).

Access to class attributes can be made with the following service.

Table 8-12 : Supported service for instance 0 class 3

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

8.4.2 Input and diagnosis data in Assembly format

8.4.2.1 Input data via Assembly instance 5 (all module types)

Format : 16 bit inputs according to the specification

Table 8-13: Input data class 4 instance 5

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5	0	Intput Channel 7	Input Channel 6	Input Channel 5	Input Channel 4	Input Channel 3	Input Channel 2	Input Channel 1	Input Channel 0
	1	Input Channel 17	Input Channel 16	Input Channel 15	Input Channel 14	Input Channel 13	Input Channel 12	Input Channel 11	Input Channel 10

Access to class attributes can be made with the following service.

Table 8-14: Supported services for instance 5 in class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.2.2 Input data + sensor short circuit via Assembly instance 25 (all module types)

Format according to specification

Table 8-15: Input data class 4 instance 15

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
15	0	Input Channel 13	Input Channel 03	Input Channel 12	Input Channel 02	Input Channel 11	Input Channel 01	Input Channel 10	Input Channel 0
	1	Input Channel 17	Input Channel 07	Input Channel 16	Input Channel 06	Input Channel 15	Input Channel 05	Input Channel 14	Input Channel 4
	2	IGS	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”

Access to class attributes can be made with the following service.

Table 8-16: Supports services for instance 15 in class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.2.3 Input data + sensor short circuit via Assembly instance 25 (all module types)

Format : 16 bit inputs and status bit for each input (according to spec.)

Table 8-17 : Input data + sensor short circuit in class 4 instance 25

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
25	0	Input Channel 7	Input Channel 6	Input Channel 5	Input Channel 4	Input Channel 3	Input Channel 2	Input Channel 1	Input Channel 0
	1	Input Channel 17	Input Channel 16	Input Channel 15	Input Channel 14	Input Channel 13	Input Channel 12	Input Channel 11	Input Channel 10
	2	Status Channel 7	Status Channel 6	Status Channel 5	Status Channel 4	Status Channel 3	Status Channel 2	Status Channel 1	Status Channel 0
	3	Status Channel 17	Status Channel 16	Status Channel 15	Status Channel 14	Status Channel 13	Status Channel 12	Status Channel 11	Status Channel 10

The input **Status** indicates the presence of a **sensor short circuit** at the channel. On the M12 sockets the sensor short circuit appears in both channels.

Access to class attributes can be made with the following service.

Table 8-18: Supported services for instance 25 in class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.2.4 Diagnosis Actuator disabled, Assembly instance 44 (only for Art.-No. 55298 and 55299)

Table 8-21 : Diagnosis Actuator disabled in class 4 instance 44

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
34	0	Actuator disabled Channel 7	Actuator disabled Channel 6	Actuator disabled Channel 5	Actuator disabled Channel 4	Actuator disabled Channel 3	Actuator disabled Channel 2	Actuator disabled Channel 1	Actuator disabled Channel 0

Access to class attributes can be made with the following service.

Table 8-2219 : Supported service for instance 100 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).Input data + diagnosis data via Assembly instance 100 (all modules types)

8.4.2.5 Input data + diagnosis data via Assembly instance 100 (all module types)

Manufacturer specific format with 16 bit inputs, status bit for each input, global diagnosis and Desina diagnosis.

Table 8-20 : Input data – Standard data format for I/O data, Art.-No. 55297

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
100	0	Input Channel 7	Input Channel 6	Input Channel 5	Input Channel 4	Input Channel 3	Input Channel 2	Input Channel 1	Input Channel 0
	1	Input Channel 17	Input Channel 16	Input Channel 15	Input Channel 14	Input Channel 13	Input Channel 12	Input Channel 11	Input Channel 10
	2	Status Channel 7	Status Channel 6	Status Channel 5	Status Channel 4	Status Channel 3	Status Channel 2	Status Channel 1	Status Channel 0
	3	Status Channel 17	Status Channel 16	Status Channel 15	Status Channel 14	Status Channel 13	Status Channel 12	Status Channel 11	Status Channel 10
	4	Global diagnosis status							
	5	Desina Channel 17	Desina Channel 16	Desina Channel 15	Desina Channel 14	Desina Channel 13	Desina Channel 12	Desina Channel 11	Desina Channel 10

Access to class attributes can be made with the following service.

Table 8-20 : Supported service for instance 100 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.2.6 Inputs + diagnosis via Assembly instance 102 (only for Art.-No. 55298 and 55299)

Manufacturer specific format for parameterization.

Table 8-213 : Inputs + diagnosis data, manufacturer specific format, class 4 instance 102

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
102	0	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
	1	Make / Break Channel 7	Make / Break Channel 6	Make / Break Channel 5	Make / Break Channel 4	Make / Break Channel 3	Make / Break Channel 2	Make / Break Channel 1	Make / Break Channel 0
	2	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10
	3	Input / Output Channel 7	Input / Output Channel 6	Input / Output Channel 5	Input / Output Channel 4	Input / Output Channel 3	Input / Output Channel 2	Input / Output Channel 1	Input / Output Channel 0
	4	Output Fault Action Channel 7	Output Fault Action Channel 6	Output Fault Action Channel 5	Output Fault Action Channel 4	Output Fault Action Channel 3	Output Fault Action Channel 2	Output Fault Action Channel 1	Output Fault Action Channel 0
	5	Output Fault Value Channel 7	Output Fault Value Channel 6	Output Fault Value Channel 5	Output Fault Value Channel 4	Output Fault Value Channel 3	Output Fault Value Channel 2	Output Fault Value Channel 1	Output Fault Value Channel 0

Access to class attributes can be made with the following service.

Table 8-224 : Supported service for insance 102 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.2.7 Inputs + diagnosis via Assembly instance 104 (only for Art.-No. 55298 and 55299)

Table 8-235 : Input data – Standard data format for I/O data, Art.-No. 55298

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
104	0	Input Channel 7	Input Channel 6	Input Channel 5	Input Channel 4	Input Channel 3	Input Channel 2	Input Channel 1	Input Channel 0
	1	Input Channel 17	Input Channel 16	Input Channel 15	Input Channel 14	Input Channel 13	Input Channel 12	Input Channel 11	Input Channel 10
	2	Status Channel 7	Status Channel 6	Status Channel 5	Status Channel 4	Status Channel 3	Status Channel 2	Status Channel 1	Status Channel 0
	3	Status Channel 17	Status Channel 16	Status Channel 15	Status Channel 14	Status Channel 13	Status Channel 12	Status Channel 11	Status Channel 10
	4	Global diagnosis status							
	5	Desina Channel 17	Desina Channel 16	Desina Channel 15	Desina Channel 14	Desina Channel 13	Desina Channel 12	Desina Channel 11	Desina Channel 10
	6	Actuator disabled Channel 7	Actuator disabled Channel 6	Actuator disabled Channel 5	Actuator disabled Channel 4	Actuator disabled Channel 3	Actuator disabled Channel 2	Actuator disabled Channel 1	Actuator disabled Channel 0
	7	Actuator warning Channel 7	Actuator warning Channel 6	Actuator warning Channel 5	Actuator warning Channel 4	Actuator warning Channel 3	Actuator warning Channel 2	Actuator warning Channel 1	Actuator warning Channel 0

Access to class attributes can be made with the following service.

Table 8-246 : Supported service in instance 104 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.2.8 Inputs + diagnosis via Assembly instance 110 (only Art.-No. 55299)

Table 8-25 :Input data table Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 13	Input Channel 03	Input Channel 12	Input Channel 02	Input Channel 11	Input Channel 01	Input Channel 10	Input Channel 00
1	Input Channel 17	Input Channel 07	Input Channel 16	Input Channel 06	Input Channel 15	Input Channel 05	Input Channel 14	Input Channel 04
2	Status Channel 07/17	Status Channel 06/16	Status Channel 05/15	Status Channel 04/14	Status Channel 03/13	Status Channel 02/12	Status Channel 01/11	Status Channel 00/10
3	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”

Access to class attributes can be made with the following service.

Table 8-26: Supported services in instance 110 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.2.9 Inputs + diagnosis via Assembly instance 111 (only Art.-No. 55299)

Table 8-27 : Input data table Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Input Channel 13	Input Channel 03	Input Channel 12	Input Channel 02	Input Channel 11	Input Channel 01	Input Channel 10	Input Channel 00
1	Status Channel 13	Status Channel 03	Status Channel 12	Status Channel 02	Status Channel 11	Status Channel 01	Status Channel 10	Status Channel 00
2	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”
3	Status Channel 17	Status Channel 07	Status Channel 16	Status Channel 06	Status Channel 15	Status Channel 05	Status Channel 14	Status Channel 04
4	always “0”	APS[8]	always “0”	always “0”	always “0”	always “0”	always “0”	always “0”

Access to class attributes can be made with the following service.

Table 8-28: Supported services instance 104 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

[8] APS – Aux Power Status

8.4.2.10 Inputs + diagnosis in Assembly format for Art.-No. 55299

8.4.2.10.1 Diagnosis actuator disabled Assembly instance 45 (only Art.-No. 55299)

Table 8-29: Diagnosis actuator disable assembly class 4 instance 45

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
35	0	Actuator disable Channel 07	Actuator disable Channel 06	Actuator disable Channel 05	Actuator disable Channel 04	Actuator disable Channel 03	Actuator disable Channel 02	Actuator disable Channel 01	Actuator disable Channel 00
	1	Actuator disable Channel 17	Actuator disable Channel 16	Actuator disable Channel 15	Actuator disable Channel 14	Actuator disable Channel 13	Actuator disable Channel 12	Actuator disable Channel 11	Actuator disable Channel 10

Access to class attributes can be made with the following service.

Table 8-30: Supported services for instance 45 in class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.2.11 Inputs + diagnosis via Assembly instance 107 (only Art.-No. 55299)

Manufacturer specific format with 16 bits input, status bit for each input (status of sensor supply), group diagnose for the module and kaDesina diagnosis per channel

Table 8-31: Input data table – Standard data format for I/O files Art.-No. 55299

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
107	0	Input Channel 07	Input Channel 06	Input Channel 05	Input Channel 04	Input Channel 03	Input Channel 02	Input Channel 01	Input Channel 00
	1	Input Channel 17	Input Channel 16	Input Channel 15	Input Channel 14	Input Channel 13	Input Channel 12	Input Channel 11	Input Channel 10
	2	Status Channel 07	Status Channel 06	Status Channel 05	Status Channel 04	Status Channel 03	Status Channel 02	Status Channel 01	Status Channel 00
	3	Status Channel 17	Status Channel 16	Status Channel 15	Status Channel 14	Status Channel 13	Status Channel 12	Status Channel 11	Status Channel 10
	4	Global diagnosis status							
	5	Desina Channel 17	Desina Channel 16	Desina Channel 15	Desina Channel 14	Desina Channel 13	Desina Channel 12	Desina Channel 11	Desina Channel 10
	6	Actuator disable Channel 07	Actuator disable Channel 06	Actuator disable Channel 05	Actuator disable Channel 04	Actuator disable Channel 03	Actuator disable Channel 02	Actuator disable Channel 01	Actuator disable Channel 00
	7	Actuator warning Channel 07	Actuator warning Channel 06	Actuator warning Channel 05	Actuator warning Channel 04	Actuator warning Channel 03	Actuator warning Channel 02	Actuator warning Channel 01	Actuator warning Channel 00
	8	Actuator disable Channel 17	Actuator disable Channel 16	Actuator disable Channel 15	Actuator disable Channel 14	Actuator disable Channel 13	Actuator disable Channel 12	Actuator disable Channel 11	Actuator disable Channel 10
	9	Actuator warning Channel 17	Actuator warning Channel 16	Actuator warning Channel 15	Actuator warning Channel 14	Actuator warning Channel 13	Actuator warning Channel 12	Actuator warning Channel 11	Actuator warning Channel 10

Access to class attributes can be made with the following service.

Table 8-32:Supported services in instance 0 class 3

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3 Output and parameter data in Assembly format

8.4.3.1 Data format for parameterization via Assembly instance 101 (all module types)

Manufacturer specific format for parameterization of pin 2 (channels 10 to 17) and Make / Break function.

Table 8-33 : Parameterization – Standard data format for I/O data, Art.-No. 55297

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
101	0	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
	1	Make / Break Channel 7	Make / Break Channel 6	Make / Break Channel 5	Make / Break Channel 4	Make / Break Channel 3	Make / Break Channel 2	Make / Break Channel 1	Make / Break Channel 0
	2	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10

Access to class attributes can be made with the following services.

Table 8-34 : Supported services for instance 101 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3.2 8 bit output data via Assembly instance 34 (only for Art.-No. 55298 and 55299)

Table 8-35 : Output data format class 4 Assembly instance 34

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
34	0	Output Channel 7	Output Channel 6	Output Channel 5	Output Channel 4	Output Channel 3	Output Channel 2	Output Channel 1	Output Channel 0

Access to class attributes can be made with the following services.

Tabe 8-36 : Supported services for assembly instance 34 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3.3 Outputs and parameter via Assembly instance 103 (only for Art.-No. 55298 and 55299)

Manufacturer specific format for parameterization and output data

Table 8-37 : Output data format class 4 Assembly instance 103

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
103	0	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
	1	Make / Break Channel 7	Make / Break Channel 6	Make / Break Channel 5	Make / Break Channel 4	Make / Break Channel 3	Make / Break Channel 2	Make / Break Channel 1	Make / Break Channel 0
	2	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10
	3	Input / Output Channel 7	Input / Output Channel 6	Input / Output Channel 5	Input / Output Channel 4	Input / Output Channel 3	Input / Output Channel 2	Input / Output Channel 1	Input / Output Channel 0
	4	Output Fault Action Channel 7	Output Fault Action Channel 6	Output Fault Action Channel 5	Output Fault Action Channel 4	Output Fault Action Channel 3	Output Fault Action Channel 2	Output Fault Action Channel 1	Output Fault Action Channel 0
	5	Output Fault Value Channel 7	Output Fault Value Channel 6	Output Fault Value Channel 5	Output Fault Value Channel 4	Output Fault Value Channel 3	Output Fault Value Channel 2	Output Fault Value Channel 1	Output Fault Value Channel 0
	6	Output value Channel 7	Output value Channel 6	Output value Channel 5	Output value Channel 4	Output value Channel 3	Output value Channel 2	Output value Channel 1	Output value Channel 0

Access to class attributes can be made with the following services.

Table 8-38 : Supported services for instance 103 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3.4 Output and parameters via Assembly instance 105 (only for Art.-No. 55298 and 55299)

Manufacturer specific format for parameterization and output data

Table 8-39 : Output data format – Standard data format for I/O data, Art.-No. 55298

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
105	0	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
	1	Make / Break Channel 7	Make / Break Channel 6	Make / Break Channel 5	Make / Break Channel 4	Make / Break Channel 3	Make / Break Channel 2	Make / Break Channel 1	Make / Break Channel 0
	2	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Braek Channel 10
	3	Input / Output Channel 7	Input / Output Channel 6	Input / Output Channel 5	Input / Output Channel 4	Input / Output Channel 3	Input / Output Channel 2	Input / Output Channel 1	Input / Output Channel 0
	4	Output value Channel 7	Output value Channel 6	Output value Channel 5	Output value Channel 4	Output value Channel 3	Output value Channel 2	Output value Channel 1	Output value Channel 0

Access to class attributes can be made with the following services.

Table 8-40 : Supported services for instance 105 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3.5 Output data via Assembly instance 34 (only for Art.-No. 55299)

Table 8-41: Output data format class 4 Assembly instance 34

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Output Channel 17	Output Channel 07	Output Channel 16	Output Channel 06	Output Channel 15	Output Channel 05	Output Channel 14	Output Channel 04

Access to class attributes can be made with the following services.

Table 8-42: Supported services for instance 34 in class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3.6 16 bit output data via Assembly instance 35 (only for Art.-No. 55299)

Table 8-43 : Output data format class 4 Assembly instance 35

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
35	0	Output Channel 7	Output Channel 6	Output Channel 5	Output Channel 4	Output Channel 3	Output Channel 2	Output Channel 1	Output Channel 0
	1	Output Channel 17	Output Channel 16	Output Channel 15	Output Channel 14	Output Channel 13	Output Channel 12	Output Channel 11	Output Channel 10

Access to class attributes can be made with the following services.

Table 8-44 : Supported services for instance 35 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3.7 Outputs and parameterization via Assembly instance 106 (only for Art.-No. 55299)

Table 8-45 : Output data format class 4 Assembly instance 106

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
106	1	Input / Output Channel 7	Input / Output Channel 6	Input / Output Channel 5	Input / Output Channel 4	Input / Output Channel 3	Input / Output Channel 2	Input / Output Channel 1	Input / Output Channel 0
	2	Input / Output Channel 17	Input / Output Channel 16	Input / Output Channel 15	Input / Output Channel 14	Input / Output Channel 13	Input / Output Channel 12	Input / Output Channel 11	Input / Output Channel 10
	3	Output value Channel 7	Output value Channel 6	Output value Channel 5	Output value Channel 4	Output value Channel 3	Output value Channel 2	Output value Channel 1	Output value Channel 0
	4	Output value Channel 17	Output value Channel 16	Output value Channel 15	Output value Channel 14	Output value Channel 13	Output value Channel 12	Output value Channel 11	Output value Channel 10

Access to class attributes can be made with the following services.

Table 8-46 : Supported services for instance 106 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3.8 Output data and parameterization via Assembly instance 108 (only for Art.-No. 55299)

Table 8-47 : Output data – Standard data format for I/O data, Art.-No. 55299

Instance	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
108	0	Output value Channel 17	Output value Channel 16	Output value Channel 15	Output value Channel 14	Output value Channel 13	Output value Channel 12	Output value Channel 11	Output value Channel 10
	1	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
	2	Make / Break Channel 7	Make / Break Channel 6	Make / Break Channel 5	Make / Break Channel 4	Make / Break Channel 3	Make / Break Channel 2	Make / Break Channel 1	Make / Break Channel 0
	3	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10
	4	Input / Output Channel 7	Input / Output Channel 6	Input / Output Channel 5	Input / Output Channel 4	Input / Output Channel 3	Input / Output Channel 2	Input / Output Channel 1	Input / Output Channel 0
	5	Input / Output Channel 17	Input / Output Channel 16	Input / Output Channel 15	Input / Output Channel 14	Input / Output Channel 13	Input / Output Channel 12	Input / Output Channel 11	Input / Output Channel 10
	6	Output value Channel 7	Output value Channel 6	Output value Channel 5	Output value Channel 4	Output value Channel 3	Output value Channel 2	Output value Channel 1	Output value Channel 0

Access to class attributes can be made with the following services.

Table 8-48 : Supported services for instance 108 class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.4.3.9 Output data via Assembly instance 109 (only for Art.-Nr. 55299)

Table 8-49 : Output data via Assembly instance 109 for Art.-No. 55299

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Output value Channel 07	Output value Channel 06	Output value Channel 05	Output value Channel 04	Output value Channel 03	Output value Channel 02	Output value Channel 01	Output value Channel 00
1	Output value Channel 17	Output value Channel 16	Output value Channel 15	Output value Channel 14	Output value Channel 13	Output value Channel 12	Output value Channel 11	Output value Channel 10
2	Input / Diagnosis Channel 17	Input / Diagnosis Channel 16	Input / Diagnosis Channel 15	Input / Diagnosis Channel 14	Input / Diagnosis Channel 13	Input / Diagnosis Channel 12	Input / Diagnosis Channel 11	Input / Diagnosis Channel 10
3	Make / Break Channel 07	Make / Break Channel 06	Make / Break Channel 05	Make / Break Channel 04	Make / Break Channel 03	Make / Break Channel 02	Make / Break Channel 01	Make / Break Channel 00
4	Make / Break Channel 17	Make / Break Channel 16	Make / Break Channel 15	Make / Break Channel 14	Make / Break Channel 13	Make / Break Channel 12	Make / Break Channel 11	Make / Break Channel 10
5	Input / Output Channel 07	Input / Output Channel 06	Input / Output Channel 05	Input / Output Channel 04	Input / Output Channel 03	Input / Output Channel 02	Input / Output Channel 01	Input / Output Channel 00
6	Input / Output Channel 17	Input / Output Channel 16	Input / Output Channel 15	Input / Output Channel 14	Input / Output Channel 13	Input / Output Channel 12	Input / Output Channel 11	Input / Output Channel 10

Access to class attributes can be made with the following services.

Table 8-50: Supported services for instance 34 in class 4

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.5 Class 5 Connection Object

8.5.1 Instance 0

The following class attributes are implemented.

Table 8-51 : Instance 0 class 5

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Revision	UINT	Revision of the Identity Object Class Definition	2

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).

Access to class attributes can be made with the following service.

Table 8-52 : Supported service for instance 0 class 5

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

8.5.2 Connection Object instances

An instance is implemented for every link. The structure of the instances conforms to the ODVA DN specification, Volume I Release 2.0 Errata 5.

- Instance 1 : Explicit Message Connection,
- Instance 2 : Poll Connection,
- Instance 3 : Change of State Connection,
- Instance 4: Cycle Connection.

Table 8-53 : Instances in class 5

Attribute ID	Attribute Name	Data Type	Description of Attribute
1	State	USINT	State of the object
2	instance_type	USINT	Indicates either I/O or Messaging Connection
3	transportClass_trigger	BYTE	Defines behavior of the Connection
4	produced_connection_id	UINT	Placed in CAN Identifier Field when the Connection transmits
5	consumed_connection_id	UINT	CAN Identifier Field value that denotes message to be received
6	initial_comm_characteristics	BYTE	Defines the Message Group(s) across which productions and consumptions associated with this Connection occur
7	produced_connection_size	UINT	Maximum number of bytes transmitted across this Connection
8	consumed_connection_size	UINT	Maximum number of bytes received across this Connection
9	expected_packet_rate	UINT	Defines timing associated with this Connection
12	watchdog_timeout_action	USINT	Defines how to handle Inactivity/Watchdog timeouts
13	produced_connection_path_length	UINT	Number of bytes in the produced_connection_path attribute
14	produced_connection_path	EPATH	Specifies the Application Object(s) whose data is to be produced by this Connection Object. See Appendix I
15	consumed_connection_path_length	UINT	Number of bytes in the consumed_connection_path attribute
16	consumed_connection_path	EPATH	Specifies the Application Object(s) that are to receive the data consumed by this Connection Object. See Appendix I.
17	production_inhibit_time	UINT	Defines minimum time between new data production. This attribute is required for all I/O Client connections, except those with a production trigger of Cyclic.

Access to class attributes can be made with the following services.

Table 8-54 : Supported services for instance 0 class 3

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.6 Class 8 Digital Input Object

8.6.1 Attributes of class 8 instance 0

Table 8-55 : Instance 0 class 8

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Revision	UINT	Revision of the Identity Object Class Definition	2
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The largest instance number of a created object at this class hieraychy level

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).
Access to class attributes can be made with the following service.

Table 8-56 : Supported service for instance 0 class 8

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}). Attributes of class 1 instance 1.
The instance attributes listed in the following table have been implemented for the instance "Identity Object".

8.6.2 Input point attributes

Table 8-57 : Instances of class 8

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
3	Get	Value	BOOL	Input point value	0 = Aus / 1 = Ein
4	Get	Status	BOOL	Input point status	0 = no error / 1 = sensor short circuit

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).
Access to class attributes can be made with the following service.

Table 8-58 : Supported services for the instances 1 to max. 16, class 8

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.7 Class 9 Digital Output Object

8.7.1 Attributes of class 9 instance 0

Table 8-59 : Instance 0 class 9

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Revision	UINT	Revision of the Identity Object Class Definition	1
2	Get	Max Instance	UINT	Maximum instance number of an object currently created in this class level of the device	The largest instance number of a created object at this class hieraychy level

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).
Access to class attributes can be made with the following service.

Table 8-60 : Supported service for instance 0 class 9

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}). Attributes of class 1 instance 1.
The instance attributes listed in the following table have been implemented for the instance "Identity Object".

8.7.2 Output point attributes

Table 8-61 : Instances of class 9

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
3	Get / Set	Value	BOOL	Output point value	0 = Off / 1 = On
4	Get	Status	BOOL	Output point status	0 = no error / 1 = Actuator disabled
5	Get / Set	Fault action	BOOL	Output point value	0 = Off / 1 = On
6	Get / Set	Fault value	BOOL	Output point status	0 = no error / 1 = Actuator warning

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).
Access to class attributes can be made with the following services.

Table 8-62 : Supported services for the instances 1 to max. 16, class 9

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

8.8 Class 15 Parameter Object

The Parameter object gives access via Explicite Message Service to all the settings and diagnosis information of the MVK-MDN and allows to save parameters into a Flash memory. If the Murreletronik EDS file is used, you will not need the following information since all the required data are already contained in the EDS file and in the controller software.

8.8.1 Instance 0 Saving parameters

The following class attributes are implemented.

Table 8-63 : Instance 0 class 15

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Revision	UINT	Revision of the Identity Object Class Definition	1

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).
Access to class attributes can be made with the following services.

Table 8-64 : Supported services for instance 0 class 15

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
16_{Hex}	Save	Save current parameter in non-volatile memory

8.8.2 Instance 1 Parameters Diagnosis input / Function input

Table 8-65 : Parameter intance 1

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get / Set	Parameter Value	BYTE	Parameter Diagnosis input / Function input	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0020
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$ [9]
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

[9] for a detailed description of the data type coding, see Volume I, Appendix J, Section J-6.1 of the DeviceNet Specification V2.0

8.8.3 Instance 2 Parameter Make / Break, channels 0 to 7

Table 8-66 : Parameter instance 2

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get / Set	Parameter Value	BYTE	Parameter Make / Break	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0020
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.4 Instance 3 Parameter Make / Break, channels 10 to 17

Table 8-67 : Parameter instance 3

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get / Set	Parameter Value	BYTE	Parameter Make / Break	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0020
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.5 Instance 4 Global diagnosis

Table 8-68 : Parameter instance 3

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Parameter Value	USINT	Global diagnosis	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0030
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	USINT	Number of bytes in Parameter Value	1

8.8.6 Instance 5 Desina diagnosis

Table 8-69 : Parameter instance 5

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Parameter Value	BYTE	Global diagnosis	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0030
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.7 Instance 6 Parameter Input / Output, channels 0 to 7 (only for Art.-No. 55298 and 55299)

Table 8-70 : Parameter instance 6

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get / Set	Parameter Value	BYTE	Parameter Diagnosis input / Function input	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0020
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.8 Instance 7 Actuator disabled, channels 0 to 7 (only for Art.-No. 55298 and 55299)

Table 8-71 : Parameter instance 7

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Parameter Value	BYTE	Actuator disabled	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0030
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.9 Instance 8 Actuator warning, channels 0 to 7 (only for Art.-No. 55298 and 55299)

Table 8-72 : Parameter instance 8

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Parameter Value	BYTE	Actuator warning	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0030
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.10 Instance 9 Parameter Input / Output, channels 10 to 17 (only for Art.-No. 55299)

Table 8-73 : Parameter instance 9

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get / Set	Parameter Value	BYTE	Parameter Diagnosis input / Function input	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0020
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.11 Instance 10 Actuator diasabled, channels 10 to 17 (only for Art.-No. 55299)

Table 8-74 : Parameter instance 7

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Parameter Value	BYTE	Actuator disabled	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0030
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.12 Instance 11 Actuator warning, channels 10 to 17 (only for Art.-No. 55299)

Table 8-75 : Parameter instance 8

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get	Parameter Value	BYTE	Actuator warning	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0030
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.8.13 Instance 12 Parameterization format transfer (only or Art.-No. 55299)

Table 8-76: Parameter instance 12

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Value
1	Get / Set	Parameter Value	BYTE	Parameter format transfer	Current value of parameter
2	Get	Link Path		no internal reference	0
3	Get	Link Size		no internal reference	0
4	Get	Descriptor	WORD	Description of parameter.	0x0020
5	Get	Data Type	EPATH	Data type code.	$C6_{Hex}$
6	Get	Data Size	BYTE	Number of bytes in Parameter Value	1

8.9 Class 43 Acknowledge Handler Object

8.9.1 Instance 0

The following class attributes are implemented.

Table 8-77 : Instance 0 in the Acknowledge Handler Object

Attribut ID	Access Rule	Name	DeviceNet Data Type	Description of Attribut	Semantics of Value
1	Get	Revision	UINT	Revision of the Identity Object Class Definition	2

Optional class attributes are not supported and rejected with the DeviceNet error message *Attribut not supported* (14_{Hex}).
Access to class attributes can be made with the following service.

Table 8-78 : Supported service for instance 0 in the Acknowledge Handler Object

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value

8.9.2 Instance 1

Table 8-79 : Instance 1 class $2B_{Hex}$

Attribute ID	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get /Set	Acknowledge Timer	UINT	Time to wait for acknowledge before resending	Range 1-65,535 ms (0 invalid) default = 16
2	Get/Set	Retry Limit	USINT	Number of Ack Timeouts to wait before informing the producing application of a RetryLimit_Reached event.	Range 0-255 default = 1
3	Set (Inactive) Get (Active)	COS Producing Connection Instance	UINT	Connection Instance which contains the path of the producing I/O application object which will be notified of Ack Handler events.	Connection Instance ID
4	Get	Ack List Size	BYTE	Maximum number of members in Ack List	0 = Dynamic >0 = Max number of members
5	Get	Ack List	BYTE Array of UINT	List of active connection instances which are receiving Acks.	Number of members followed by list of: Connection Instance ID
6	Get	Data with Ack Path List Size	BYTE	Maximum number of members in Data with Ack Path List	0 = Dynamic >0 = Max number of members
7	Get	Data with Ack Path List	BYTE Array of UINT USINT Array of USINT	List of connection instance/consuming application object pairs.This attribute is used to forward data received with acknowledgment.	Number of members followed by list of: Connection Instance ID/DeviceNet path length/DeviceNet path

Access to class attributes can be made with the following services.

Table 8-80 : Supported services for instance 0 class $2B_{Hex}$

Service Code	Service Name	Description of Service
$0E_{Hex}$	Get_Attribut_Single	Used to read an Identity Object Class Attribut Value
10_{Hex}	Set_Attribut_Single	Used to modify a DeviceNet Object Instance Attribut Value

The optional services provided in the DeviceNet specification are not supported and rejected with the error message *Service not supported* (08_{Hex}).

9 Technical data

9.1 Mechanical data

Technical data	MVK-MDN DI8 (DI8) Art.No. 55 297	MVK-MDN DIO8 (DI8) Art.No. 55 298	MVK-MDN DIO8 (DIO8) Art.No. 55 299
Ambient conditions			
Operating temperature	0°C..55°C		
Storage temperature	-25°C..75°C		
Flammability classification	UL 94 V0		
Chemical and oil resistance	Good chemical and oil resistance. When using aggresive mediums, materiel resistance based on application must be checked.		
Materials			
Housing	Zinc die cast, black chromated		
Contact mount M12	PLC (UL94 V0), black		
Contact mount 7/8“	TPE PA 6.6 (UL94 V2), black		
Contact	CuZn, nickel undercoat and gold-plated		
O-Ring M12	Viton, green		
O-Ring 7/8“	NBR, black		
Light comb+light ring	PC(UL94, V0)		
Mechanical data			
Insertion force / contact	≤ 50		
Enclosure type EN 60629	IP 67 (only in plugged and bolted condition)		
Vibration, sine shaped EN 60068-2-6	Floating sine 10 to 60 Hz : amplitude 0.35 mm Floating sine 60 to 500 Hz : acceleration 15 g[10]		
Shock, half-sine shaped	Shock duration 11 ms[1]		
EN 60068-2-27	Shock acceleration 50 g[1]		
Design information			
Dimensions (LxWxH)	220 x 63 x 48 mm		
Mounting distance	208,5 ±0,5 mm		
Weight	approx. 760 g		
Torque			
Round plug connector M12	0,6 Nm		
Mounting screws M6	8 Nm		
Connection possibilities			
Supply cables	7/8“ connector 5-pin with outgoing power supply connection		
DeviceNet	M12 connectors (A-encoded) 5-pin		
I/O cables	8 x M12 round plug connectors (A-encoded) 5 pin		

[10] Valid with 20 g vibration according to EN 60068-2-27 and 80 g shock according to MIL STD-800

9.2 Electrical data

Technical data	MVK-MDN DI8 (DI8) Art.No. 55 297	MVK-MDN DIO8 (DI8) Art.No. 55 298	MVK-MDN DIO8 (DIO8) Art.No. 55 299
Max. number of inputs	16	16	16
Max. number of outputs		8	16
Operating voltage	18 ... 30 V DC		
Current consumption	approx. 120 mA		
Sensor supply	24 V DC ± 25 %		
Actutator supply	24 V DC ± 25 %		
Sensor supply			
Max. current	max. 200 mA per M12 socket		
Overload / Short circuit Fuse	Multifuse (for each M12 socket)	<= 100 mA	Automatic restart
		> 100 mA	Reset required
	Tripping time 1 s at I_k >= 1 A and 23°C ambient temperature		
Reverse polarity protection			
- Module electronics	Yes		
- Sensors	No		
- Actuators	No		
Outputs			
Rated current		1,6 A per channel	
Max. sum current		8 A	
Overvoltage protection		Yes (Suppressor diode)	
Cable length		0,75 mm²	Max. 10 m
		0,34 mm²	Max. 5 m
Core cross section		Max. 1,5 mm²	
Signal delay		Max. 2 ms	
Max. switch frequency under ohmic load		50 Hz	
Max. switch frequency under inductive load		5 Hz	
Max. lamp load		10 W	
Overload / Short circuit Fuse		electronic short circuit detection	
		Tripping time < 5 ms	
Inputs			
Input characteristic	IEC 61131-2, type 2		
Input filter	approx. 1 ms		
Signal delay	max. 2 ms		
Overload protection	Yes (Supressor diode)		
EMV			
EN 61131-2	EN 61000-4-2 ESD	Contakt ± 4 kV ; Air ± 8 kV	
	EN 61000-4-3 HF-Field+GSM	10 V/m	
	EN 61000-4-4 Burst	± 2 kV	
	EN 61000-4-5 Surge	Asym../sym. ± 0,5 kV DC line input	
		Asym. ± 1 kV Signal connections	
	EN 61000-4-6 HF-asymmetric	10 V	
	EN 61000-4-8 Magnetic field 50 Hz	30 A/m	
	EN 50081-1 Interference strength	QP 30 dBµV/m (30-230 MHz)	
		QP 37 dBµV/m (230-1000 MHz)	

Technical data	MVK-MDN DI8 (DI8) Art.No. 55 297	MVK-MDN DIO8 (DI8) Art.No. 55 298	MVK-MDN DIO8 (DIO8) Art.No. 55 299
Insulation	EN 61131-2		
Rated voltage	IEC 60664-1		
Insulation resistance	IEC 61131-2		
Volume resistance	≤ 5 mΩ		
DeviceNet			
Supported baud rates	125 / 250 / 500 kBit/s.		
Protocol	DeviceNet according to ODVA specification		
Operating modes	Poll / Change of State / Cycle		
Vendor-ID	640_{Dez}		
DeviceNet address	0 – 63 selectable via BCD rotary switch		

10 Accessories

10.1 General accessories

Blind caps		
Art. No.	Packaging unit	Designation
338008		M12 diagnosis adapter (line monitoring to straps)
55 468	(4 pcs)	M12 blind cap black
338155	1 piece	M12x1 diagnosis blind cap

Self-connecting connectors	
Art. No.	Designation
27626	DeviceNet Bus M12 plug A-encoded straight type
27621	DeviceNet Bus M12 socket A-encoded straight type
27663	Power 7/8“ plug straight type
27661	Power 7/8“ socket straigth type

Power T-piece 7/8“		
Assign-ment	Art. No.	Remark
	14881	Plug-Socket-Socket

Desina®-Sensor	
- Nominal operating distance : 2 mm flush (protected 0 to 1,6 mm) - Operating voltage : 10 to 30 V DC - Current carrying capacity : 200 mA - Short-circuit-proof and polarity protected - Switching frequency : 800 Hz	
Art. No.	Designation
17259	M12 x 1 Desina®-Sensor

Valve connector type A		
- Contact gap 18 mm - Operating voltage 24 V AC/DC, pressure switch 24 V DC - Max. operating current max. 4 A		
Art. No.	Outgoing direction	Remark
3513850	M12 connection upwards	Yellow LED, protective circuit for valves
3513858		Yellow/green LED for pushbutton
3513855	M12 connection to the rear	Yellow LED, protective circuit for valves
3513859		Yellow/green LED for pushbutton

Art.No.	Designation
55 319	Terminating plug connector

Valve connector combination type A		
	- Contact gap 18 mm - Operating voltage 24 V AC/DC - Max. operating current 4 A	
Art. No.	Outgoing direction	Length of cable
3611130	M12 connection upwards	100 mm
3611150		150 mm
3611170		200 mm
3613130	M12 connection to the rear	100 mm
3613150		150 mm
3613170		200 mm

Documentation	
55392	User's manuel MVK-MDN (German/English/French)
	Other system accessories on request ++49/(0)7191/47-0

10.2 Cables

DeviceNet		
Plug-Socket straight type-straight type	**Art. No.**	**Length**
	42 34 520	0,3 m
	42 34 521	0,6 m
	42 34 522	1,0 m
	42 34 523	2,0 m
	42 34 524	3,0 m
	42 34 525	5,0 m

7/8“ power cable		
Socket straight type	**Art. No.**	**Length**
	14 558	1,5 m
	14 559	3,0 m
	14 562	5,0 m
	14 563	10,0 m

DeviceNet		
Plug-socket angle type-angle type	**Art. No.**	**Length**
	42 34 670	0,3 m
	42 34 671	0,6 m
	42 34 672	1,0 m
	42 34 673	2,0 m
	42 34 674	3,0 m
	42 34 675	5,0 m

7/8“ power cable		
Socket straight type	**Art. No.**	**Length**
	14 624	0,3 m
	14 625	0,6 m
	14 626	1,0 m
	14 628	2,0 m

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Sensor short circuit	Short circuit or overload at Pin 1 of the M12 socket causes the self-resetting fuse to blow. Each M12 socket is separately fused. A red LED indicates the fault at the associated M12 socket. This fault is indicated via the user data to the DeviceNet Master. The sensor supply restarts automatically after the fault is cleared.
Actuator disabled	Short circuit or overload at an output causes the output to be disabled. This fault is indicated to the DeviceNet master via the user data. A red LED indicates the fault at the associated M12 socket. The output is not automatically re-enabled. The output or the actuator supply voltage must be disabled after eliminating the cause of the fault. This clears the short circuit memory.
Actuator warning	When an output is disabled, the presence of 24V at the associated Pin of the M12 socket is detected. This is an indication of a "short circuit" to +24V. A red LED indicates the fault at the associated M12 socket. This fault is indicated to the DeviceNet master via the user data. This fault does not affect activation of the output. It is not possible to detect an actuator warning when the output is enabled.
Undervoltage	The voltages of the sensor supply and actuator supply are metered separately. When the voltage drops below 18 V DC, a fault is indicated to the DeviceNet master via the user data. When sensor supply undervoltage is detected, the LED labeled "U_S Error" is lit red. When actuator supply undervoltage is detected, the LED labeled "U_A Error" is lit red.
External fault	This diagnosis can only be generated by an input parameterized as a diagnostic input. External fault is indicated when 0 V is present at this input. Sensors/actuators which meet the DESINA specification are supported. Alternately, the line can be monitored for open circuit by using a diagnosis adapter.
Periphery error	A collection of individual errors wich can occur at the M12 sockets: external fault, sensor short circuit, actuator disabled and actuator warning.

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